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WE took the figures for securities owned only under "additions to income" in our comments on the annual report of the Hocking Valley in the November 18 issue of the *Railway Age Gazette*, page 957. The figures for securities owned under "assets capitalized" should also have been included, making the total for securities owned by the Hocking Valley on June 30, 1910, $13,271,561.

OCTAVE CHANUTE, who died last week, as noted in another column, did three great things: He showed it to be commercially possible to preserve ties; he was in charge of the double-tracking of the Erie; and he formulated principles on which the construction and operation of our present aeroplanes are based. In his "Progress in Flying Machines," published 16 years ago, he gave a summary of conclusions embodying his beliefs as to the character of the successful aeroplane, and it is surprising in what detail his prophesies have been fulfilled. In 1896 and 1897 he, associated with Herring, made some 2,000 flights in gliders, publishing the results of these experiments in 1897. The Wright brothers called on him for help during their experiments from 1901 to 1905, and he supplied them with both information and advice. He had a great taste for bridge building. He is particularly remembered for the Missouri bridge at Sibley, Mo., and the Mississippi river bridge at Fort Madison, Iowa. Mr. Chanute had the imagination and ability which the big French engineers have, combined with an even temperament rare in one of his nationality. He was always judicial and inquiring, and seemed naturally qualified to make investigations of unknown or little known questions.

THE mystery that surrounded the ownership of the North Coast road, now under construction in Washington, has been cleared up by the announcement by Union Pacific officers that this road is a Harriman line. The road is to parallel the Great Northern and also compete with the recently built Spokane, Portland & Seattle, owned jointly by the Great Northern and the Northern Pacific. The two main lines of the North Coast will run from Spokane, Wash., and from Walla Walla, joining at Kiona and running from there west to Portland Junction, with one line running north from Portland Junction through Tacoma to Seattle, and the other south to Portland. There are numerous branches in Washington, and the projected and completed lines, which will total about 800 miles, are direct competitors of the Hill lines in a territory in which heretofore Hill interests had been dominant. The announcement from the Union Pacific offices said that a new company, the Oregon-Washington Railroad & Navigation Co., had been organized to take over the Oregon Railroad & Navigation Co., the Oregon & Washington, the Columbia River & Central Oregon, the Ilwaco Railroad, the Des Chutes Railroad, the Lake Creek & Coeur d'Alene, the Oregon Eastern, the Oregon, Washington & Idaho, the Spokane Union Depot, the Umatilla Central and the Malheur Valley, in addition to the North Coast. The new company is to take over the operations of these lines and will probably bear much the same relation to the Union Pacific that the Oregon Railroad & Navigation Co. has borne in the past; that is, its operations will be included, as are the Oregon Short Line's, in the Union Pacific annual report under the heading, "Union Pacific Railroad and auxiliary companies." None of the lines that are to be taken over by the new company, with the exception of the Oregon Railroad & Navigation, are mortgaged, except that in some cases, where the sums advanced by the Union Pacific or the Oregon Short Line have been large, a mortgage has been given to the parent company. The Union Pacific's balance sheet of June 30, 1910, showed $46,620,520 total advances for construction and acquisition of new lines made by the Union Pacific and auxiliary companies. This, of course, would show advances to any of the construction companies made by any of the Union Pacific auxiliary lines, but would not show intercompany loans between auxiliary companies. The keen competition in railway building

that is being carried on between the Hill and Harriman lines in Oregon and Washington has previously been described at some length in these columns. The formation of an operating company to take over the Harriman lines, with the possibility of a comprehensive plan of financing the projected lines through mortgaging lines already partly built, is an important step in the struggle in the Northwest which has amounted at times to open warfare.

THE TRAIN STAFF.

THE electric train staff system and the train tablet (which works on the same general principle as the train staff), are generally recognized as the simplest and safest machines known for maintaining the space interval between trains on a busy single-track line. This has been shown by many instalations of both systems. No block signaling device has shown a higher record for safety. One railway officer, declaring that the electric train staff was the best block signal apparatus in use, gave as his reason the fact that the "emergency key" is always out of the reach of the operator. The emergency key is what gives access to the electric switch or other instrumentality by which the signalmen in charge of a "lock-and-block" or "controlled manual" apparatus, may, when necessary to prevent delays to trains, throw the lock-and-block out of service. The electric locking apparatus being thereby disconnected, the two signalmen in control of a block section are free to arrange matters between themselves over the telegraph or telephone line. They may clear or agree to the clearing of the signal to admit a train, free from any restriction except their own cautiousness.

Freedom from mechanical checks has many times been followed, however, by a mistake. A signalman who is regularly kept from error day after day by the mechanical checks in his machine seems determined, as soon as the check is removed or suspended, to commit the very error against which he ought to have learned to guard. This being so, an apparatus and system which should be perfect, and therefore require no emergency unlocking feature, have been the great desiderata. No one has discovered such a system, however. But the theory of the electric train staff comes as near to accomplishing this object as is possible. The staff itself is the only emergency key, and that is in possession of the engineman, where the signalman cannot get it. In point of fact, the number of times in a year when the use of this apparatus has to be suspended because of any trouble in or with the mechanism is exceedingly small. It is so small that no special unlocking arrangements have been provided. When all the staffs are in the machine, either one of the two signalmen may secure the right to the road unconditionally; and, on the other hand, when one staff is absent from either machine, both signalmen are absolutely prevented from getting the right to the road.

The principle of the electric train staff being thus so completely adequate, and practice with it having justified our confidence in it, it is not to be wondered at that where the apparatus is appreciated, it should be used extensively; and an instance of a new use is reported on the Atchison, Topeka & Santa Fe. On the steep grades of this company's line between Raton, N. Mex., and Jansen, the staff apparatus is used for blocking trains on double track; that is to say, on a track where trains run in one direction only. It is on the descending track. There are four block sections. This part of the line is on a grade of 3.5 per cent., and an incidental advantage of using the staff is to compel each engineman to test his air-brakes by reducing his speed to a low rate at each staff station to take on the staff. Staffs are taken out of the machine at the lower end of each block section each day by the signal maintainer, who locks them in a box and sends them to the maintainer at the upper station of that section. Each pair of machines is designed to hold 40 staffs at either end of the section. On the ascending track of this line all trains must of necessity run at very low speed, and the space interval is not enforced.

Another modification which ought to enlarge the useful field of this apparatus is the use of the staff without attendants. On the Bangor & Portland line of the Delaware, Lackawanna & Western, in Pennsylvania, this has proved highly satisfactory. On this line there are not many trains and no serious inconvenience is caused by the delay necessary for each conductor to get off, go into the station and communicate by telephone with the despatcher before taking out the staff. The conductor who wishes to take out a staff effects the necessary manipulation of the circuit closer at the distant station (which ordinarily would be done by the distant operator) by means of a separate line wire and relay. Here, as in all cases where the train staff is used, the officers and trainmen are enthusiastic in their praise of its simplicity and safety. The rule requiring every conductor at the outgoing end of a block section to put the staff into the instrument is strictly maintained; but the officers say that except for the requirement that conductors communicate as frequently as practicable with the despatcher it would be entirely feasible and safe for a conductor arriving at the end of a section to hand the staff directly to another conductor ready to move in the opposite direction into the section. With competent men and strict discipline there should be no difficulty in employing this means of saving time.

Another thing which ought to make the staff popular is its adaptability to temporary uses. Where a single track line is suddenly burdened with a large addition to its traffic, or where on short notice, or without notice, a piece of double-track has to be worked single-track, the setting up of a pair of staff instruments need take but a few hours. A few roads, notably the Great Northern, have made considerable use of the staff in this way.

The merits of the staff and the tablet should be kept in mind by railway officers at all times; but our attention has been turned to the subject just now by the statement of the Indiana State railway commission, in its report of accidents for the quarter ending September 30, last, that "the small revenues of the interurban lines make most difficult" the problem of securing the safety of passengers. The commission is discussing the butting collisions which occurred at Bluffton and other places, killing, altogether, 50 passengers. What better can an interurban line do than install one of these systems? Why should the legislature of Indiana require the block system, as it does, on the steam roads of the State and not require it on the "interurban" lines? Neither the staff nor the tablet can be installed for the very small sums to which electric railways usually seem to think they ought to limit themselves, but what is the alternative? Are people and legislatures to continue to allow these roads to kill passengers by the car-load because fares of one cent a mile do not afford a reasonable income? This old argument, that we are justified in constantly risking our lives on the cars because it is such a good thing for the community to have cheap railway transportation, has been used industriously for the last 30 years in connection with steam railway transportation in our "new" country, and it would seem to be high time to lay it aside. These safety appliances are not "cheap" in the sense in which that term is usually employed by railway managers whose first thought is the percentage of net to gross receipts, but they are the cheapest to be had without sacrificing important elements of safety.

Economy in railway operation is too large a subject to be taken up in this place; but there is one simple alternative that must always be kept in mind if one is to give due weight to the element of safety as compared with cheapness and convenience: if safety is not assured the speed of trains must be reduced. Judging from past experience this is so severe a test that many railway officers lack the courage to meet it. But can the public reasonably require anything less? To put the matter in concrete form, many interurban roads ought either to have an adequate block system or else lengthen the time of cars between termini probably 50 per cent.

RAILWAY RATES AND RAILWAY EFFICIENCY.

LOUIS T. BRANDEIS, attorney for the eastern shippers in the rate advance cases, has relieved the monotony of the hearings, and added little to the fund of useful knowledge, but much to the gayety of nations, by asserting, and undertaking to show how, the railways of the United States can reduce their operating expenses $365,000,000 a year. Mr. Brandeis' statement and the evidence he has introduced to support it merit serious consideration, only because they have been printed broadcast over the country, and, therefore, no doubt, have tended to give to the uninformed the impression that American railways are very inefficiently operated.

The first comment that suggests itself regarding the position taken by Mr. Brandeis is that it involves the abandonment of the theory on which the shippers heretofore have opposed advances in freight rates. Their contention has been that the railways have so greatly increased the efficiency of their plants and operating methods during the past ten years that, in spite of the advances that have taken place in the costs of labor and materials, they do not need higher rates. Obviously, the contention that the railways have greatly increased the efficiency of their plants and operations and do not need an increase in earnings, and the contention that they are inefficiently operated and should get the additional revenue they need by abandoning their inefficient methods, are not quite compatible. The railways of the United States, with the smallest capital expenditure per mile of any railways in the world, have carried freight and passengers at the lowest rates in the world, while paying the highest wages for labor and the highest prices for materials in the world. This does not indicate inefficient management. The manufacturers of the United States, while paying the highest wages of any manufacturers in the world, have, in the main, charged the highest prices of any manufacturers in the world for their goods. Mr. Brandeis cites the great improvements in methods in manufacturing plants as examples to be imitated by the railways. One of two things is true: either the factories of the United States, whose owners Mr. Brandeis represents, are not as efficiently operated as American railways are operated, or there has been no justification for the manufacturers raising their prices as much as they have in the last ten years, while railway rates have remained practically stationary.

There are about 236,000 miles of railway in the United States. Their operating expenses per mile in the fiscal year 1910 were $7,779, of which $1,574 was charged to maintenance of way and structures, $1,758 to maintenance of equipment, $3,920 to transportation and the rest to general expenses. The average reduction per mile in operating expenses which would have to be effected to obtain the aggregate economy suggested by Mr. Brandeis would be $1,546, which could be secured by a reduction of 14 per cent. in the cost of transportation, 30 per cent. in expenditures for maintenance of way and structures, and 30 per cent in expenditures for maintenance of equipment. The average operating ratios of the railways of the United States would have to be reduced from about 67 per cent. to 53 per cent. Everyone familiar with railway affairs knows that many great economies have been made within the past decade, and that many more can be effected. But everyone who is aware how fast operating expenses have increased in spite of the great improvements in plants and operating methods which have been made knows that talk of effecting any such reductions in operating expenses as Mr. Brandeis and his witnesses outlined is the merest moonshine. The larger economies have been carried out. Only the smaller remain to be made. If, in spite of the larger ones, operating expenses have increased so fast, how can it be expected that they will not continue to increase in spite of the smaller ones?

The greatest obstacle in the way of effecting even the economies that are *possible* is that the railways cannot secure from the shippers, the public and their employees the coöperation which is necessary to render them *practicable*. One of the criticisms made by Mr. Brandeis of railway operation is that cars and engines are not loaded as heavily as they might be and that the average movement of a freight car is only 25 miles a day. The railway managers have been struggling for years to remedy these conditions, and Mr. Brandeis' clients and other shippers have prevented their correction. The two main things necessary to get cars loaded more heavily is to raise the minimum carload weights and to hold at terminals cars carrying less-than-carload freight until they are fully loaded. The railways in recent years have made many advances in carload minimums; but the opposition of the shippers has been so strong that carload minimums are lower now, compared with the average capacity of cars, than they were ten years ago. The shippers at Pittsburgh, Chicago, St. Louis and numerous other cities have within recent years successfully solicited the railways to put in operation numerous package cars running to all parts of the United States on regular schedules for the handling of less-than-carload freight. A car which runs on a regular schedule must be started on its journey when the time comes for it to leave whether it has a full load or not. The abolition of package cars would enable the roads to get heavier loading per car. But do the shippers want them to effect economy in this way, or would they rather pay a somewhat higher rate for the better service?

The only way that engines could in all cases be loaded to their maximum capacity would be to hold cars at terminals until the maximum trainload each engine could pull had been accumulated. That would result in increased economy in railway operation. But would the shippers submit to economy being secured in that way? There is constant complaint from shippers that traffic does not move expeditiously enough now. Mr. Brandeis himself bemoans the fact that the average movement of a freight car is but 25 miles a day. How does he think that the railways can detain cars until they get the maximum tonnage rating of each engine, and at the same time increase the average movement per car per day?

The statement that freight cars move an average of only 25 miles a day is true, but, as made by Mr. Brandeis, utterly misleading. The average speed of freight cars *when in motion* is not 25 miles a day, but about 10 miles an hour. The only way to form a correct opinion as to how efficiently freight cars are handled on the average by the railways is to consider in detail the average movement from the time the car is started to be loaded until it has completed its trip and been unloaded. The average time required for the loaded and empty car movement involved in the average haul of freight in the United States is about 12 days, and the average distance the car moves about 330 miles. Two days' free time is usually allowed for loading and also for unloading (not including Sundays and holidays, for which additional free time is allowed), and the statistics of the demurrage bureaus show that the delays of the car at terminals by the shippers' consignees for loading and unloading average about 4½ days for each movement. This leaves an average of 7½ days during which the car actually is in the possession of the railway and gives an average movement of about 44 miles per day. This time during which the car is in the possession of the railway includes all legitimate detention of it, such as for switching in and out at both terminals, for switching for classification in yards en route, for rigid inspection and frequent shoppings, and for transfer of lading by reason of enforcement of the stringent safety appliance regulations now in effect. It includes the period during which cars are held for reconsignment to accommodate shippers and also the periods during which cars are in shops; and, on the average, about 5 per cent. of the total number of cars are in the shops at any given time. It also includes the movement not merely of loaded cars but also of empty cars; and, of course, the average movement of empty cars is much less than of loaded cars, because the empty car stands idle on the sidings for much longer periods,

which periods of *idleness* are included in the *average movement*. The effect of a heavy reduction in traffic and a consequent proportionate increase in the number of empty cars on the average movement of all freight cars was strikingly shown just after the panic in 1907. In October, 1907, when traffic was very heavy, the average movement of all the cars in the United States was 24.8 miles per day. In April, 1908, there were substantially 700,000 idle cars, including those in shops; and in that month the average movement per day was but 19.6 miles, or 20 per cent. less than it was in October, 1907. Now, there are four months in every year when practically all the freight cars in the country are busy, and eight months when a large part of them are not in service, and, of course, the great number of cars idle during these eight months pulls down the figure showing the average movement.

When all these conditions are taken into consideration it does not seem at all surprising that the average movement of a freight car is but 25 miles a day. It also appears perfectly evident that those who are best situated to increase this average movement are the shippers, who have actual possession of the car for loading and unloading more than one-third of the time, who have practical possession of it for a considerable time for reconsignment, and whose failure to provide a more uniform traffic throughout the year makes it necessary for eight months of the year to have thousands of cars standing idle on side tracks.

The question of car efficiency is more than a matter of mere movement. Probably the best combination unit of car performance is that of ton-miles per car per day, which was invented by the committee on car efficiency of the American Railway Association. The statistics of the association show that this item is steadily increasing. The average number of tons hauled one mile per car per day in April, 1907, was 348, and in November, 1909, the record figure of 413 ton-miles per car per day was made, an increase of over 18 per cent. This increase was secured by better car loading and a reduction of empty mileage. The increase in efficiency would have been much greater if the efforts to secure it had met less opposition from the shippers.

One of the main obstacles to increasing car and locomotive efficiency is the congested condition of yards and terminals. And this condition, it would seem, can be remedied only by the expenditure of large sums of money which must either be derived from earnings or obtained by the sale of securities to the payment of the interest and dividends on which earnings must be applied.

Experience in the shops of many private concerns and of not a few railways has proved that very substantial economies might be effected in railway shops as a whole in the United States. But the difficulties in the way of introducing efficiency methods in railway shops are much greater than in other shops. If a manufacturer wishes to adopt efficiency methods and his employees object, he can lock them out or shut down his plant until they come to terms. But the railway, being a public service corporation, cannot close its shops whenever it pleases and keep them closed as long as it likes. That would mean that its transportation service would rapidly become impaired, and in course of time would cease altogether; and this the law and public opinion will not permit. Labor unions usually oppose efficiency methods, because such methods are based on the theory that each man should be paid in proportion to the quality and quantity of work he does and tend to stimulate each employee to do a greater amount of work than he otherwise would do, which results in the employment of fewer men than otherwise would be employed. Nowhere has the introduction of efficiency methods been, or is it now, more stubbornly opposed by labor unions than it is in railway shops; and it is the deliberate judgment of practically all persons competent to form an opinion that before betterment methods could be introduced in all railway shops it would be necessary to go through the worst railway strike that ever took place in this country. The railways are willing to pay the price if the public is. The only reason why they do not try forcibly to adopt betterment methods and provoke the inevitable strike is that they fear that a misguided public sentiment would side with the labor unions instead of with the roads.

It is not only in shops that railway employees are comparatively inefficient, and demand, and often get, two days' pay for one day's work. One of the reasons why the locomotive enginemen employed on the railways west of Chicago are threatening to strike is that the railway managers have refused to pay substantially twice as high wages to engineers running Mallet engines as to those running other freight engines. The Mallets have been introduced to effect economies and increase efficiency. Their purpose would be nullified if the wages paid to employees on trains where they are used were based on what the engines do instead of on what the men do. Making speeches or introducing evidence before the Interstate Commerce Commission will never make it practicable for railways to get a dollar's work for every dollar that they pay in wages. That will be rendered practicable—if it ever is—either by appeals to the good sense of employees or by the stern abitrament of strikes and lockouts; and the latter seems the more probable alternative.

Government regulation, by forcing railway executives to apply their time, thought and energies to protecting rather than to improving their properties, is tending strongly to make railway operation inefficient. Railway managers, being human, cannot do two things at once. The more thought and energy they must give to defending the roads, the less they have left for devising methods for reducing operating expenses. As the *Railway Age Gazette* has said before, "not only does government regulation as now carried on hinder the higher officers from initiating plans for improving operation, but it also interferes with their giving adequate consideration to plans worked out by their subordinates; and, of course, the important schemes of subordinates cannot be carried out until they have been digested and approved by their superiors. The public needs to be reminded that for whatever reduces the efficiency or increases the cost of railway operation it must, in the long run, foot the bill in the passenger and freight rates that it pays, or in the impaired service that it will receive, or in both. The public will be much more apt to get improved service at reasonable rates if it gives the railway managers a chance to devote more time to the administration of their properties than if it continues to compel them to give so much of their time to the defense of them."

But, after all, why, on the shippers' theory, should the railway managers be interested in the question of railway efficiency? The shippers take the ground that the railway is entitled to a fair return and no more, and that the railways of the United States as a whole are earning a fair return now. If this be true, what objection can railway managers have in trying to increase efficiency of operation? The only effect would be to increase the earnings of the roads above a fair return and to invite reductions in rates and earnings. That would benefit the shippers, but it would not benefit the stockholders of the railways; and the railway managers' employment, their salaries and their promotions come from the stockholders. The application of the "fair return" theory to the railway business would be the surest way to deaden railway enterprise and prevent the economies which Mr. Brandeis claims could be made. The only public policy which will tend to promote railway efficiency will be for the government to say in effect to the railways that they must not charge higher than reasonable rates and that they must give good service, and that so long as they meet these requirements they will be allowed to earn whatever profits they can. The only incentive that has ever been effective in promoting efficiency in the management of concerns owned by private capital has been the hope and prospect of gain to the owners; and until human nature is revolutionized it will continue to be the only effective incentive.

GREAT NORTHERN.

THE Great Northern Railway Company has often been cited as an example of a very conservatively capitalized railway corporation, and the strict truth of this assertion was quite forceably brought to public notice by the findings of the master in chancery in a recent Minnesota case. This case was brought to restrain the railway company from putting in effect rates ordered by the Minnesota railway commission on the ground among other things that they did not yield a fair return on the capital invested. At the close of the fiscal year ended June 30, 1910, the company had outstanding total bonds and stocks amounting to $319,367,409, or about $45,494 per mile of road. The master in chancery in the Minnesota case, while taking the position that the valuation of the Great Northern and the Northern Pacific properties was not necessary to a determination of a reasonable freight rate, nevertheless made a careful valuation of both properties. He placed the valuation of the Great Northern, after the deduction of its interest in the Spokane, Portland & Seattle, and charging off 12 per cent. for depreciation, at $457,131,469, or at the rate of $65,117 per mile of line.

The main points in the Minnesota case were discussed in these columns at the time the master in chancery made his report. It will be recalled that the report found the rates prescribed by Minnesota unremunerative and, therefore, unconstitutional. The chief interest in a discussion of this case in connection with the annual report of the Great Northern lies in the light thrown on the relation between the nominal capitalization of the property and its actual value as given by a disinterested outsider. Assuming that the profit and loss surplus—shown on the 1910 balance sheet as $34,997,560—is all invested in the property and capitalizable, this surplus would figure out at $4,985 per mile, which, added to the capitalization represented by stocks and bonds, makes $50,479 per mile for a property worth $65,117 per mile.

The fiscal year ended June 30, 1910, brought to the Great Northern both the largest business measured in ton miles and passenger miles, and the largest earnings in the history of the company; and, unlike so many other companies whose gross was much larger in 1910 than in 1909, the Great Northern was able to show larger net last year than the year before. It was not possible, however, to make a saving in net proportionate to the increase in gross. Total operating revenues last year were $64,500,000, an increase of $10,800,000, or 20 per cent., over the year before. Net operating revenues amounted to $25,200,000 in 1910, an increase of $4,100,000 over 1909, or slightly over 19 per cent. The revenue ton mileage of freight amounted to 5,678,800,000 in 1910, and to 4,842,000,000 in 1909. This is an increase of 17.28 per cent. in freight business handled. Passenger business on the Great Northern furnishes under ordinary conditions only about 20 per cent. of total operating revenues. In 1910, however, passenger revenue amounted to $14,300,000, or 22 per cent. of the total operating revenue. This is greater by 30.37 per cent. than the 1909 passenger revenue. The passenger mileage was 649,300,000, an increase of 32.41 per cent. over 1909. The very large increase in passenger business was due to the Alaska-Yukon-Pacific Exposition held at Seattle, and to the heavy travel also produced by the opening for settlement of the Flathead, the Coeur d'Alene and the Spokane Indian reservations and the Rocky Boy Indian land. The company also ascribes part of this increase in passenger business to its educational and advertising campaign designed to help the early settlement of lands along its lines.

The increase of 17.28 per cent. in ton mileage was handled with an increase of 15.13 per cent. in freight train miles, loaded freight car miles amounting to 280,200,000 in 1910, an increase of 14.71 per cent., and empty freight car miles amounting to 100,200,000, an increase of 19.89 per cent. The increase of 32.41 per cent. in passengers carried one mile was handled with an increase of 29.03 per cent. in passenger train miles. The average haul of revenue freight was 245 miles in 1910, as against 268 miles in 1909. The average length of passenger journey was 77.82 miles last year and 68.15 the year before.

The average receipts per ton per mile last year were 8.219 mills, as compared with 8.151 mills in 1909. The slight increase in rate is due to a greater proportion of high grade tonnage, and also to the greater proportion of short haul business. The freight rate received by the Great Northern is very much the same as that received by the Northern Pacific. The average revenue per passenger per mile was 2.204 cents in 1910, a decrease of 0.35 mills.

The Great Northern was able to hold down operating expenses in better shape than was the case with its competitors to the south of it. Total expenses last year amounted to $39,300,000, an increase of $6,700,000, or 20.66 per cent. As will be seen from the table accompanying this review, the increase in expenses was quite evenly divided between maintenance and cost of conducting transportation. The operating ratio last year was 60.92 per cent., and in 1909, 60.64 per cent. It is impossible to give the unit costs of maintenance of equipment, since the company's report does not show the details of operating expenses.

The 1910 balance sheet shows cash on hand amounting to $6,650,000 and total current assets of $14,900,000. Current liabilities amounted to $10,200,000, of which $851,000 are accounts payable, exclusive of vouchers, payrolls, etc. In 1909 the company had cash on hand totaling $9,140,000 and total current assets amounting to $16,000,000, with total current liabilities amounting to $7,500,000. During the year the company sold $9,700,000 Pacific extension 4 per cent. bonds and $3,500,000 consolidated mortgage 4 per cent. bonds. Consolidated mortgage bonds were issued in exchange for Dakota extension bonds surrendered and cancelled, and for second mortgage bonds redeemed. The net increase in amount of bonds outstanding in the hands of the public was $9,400,000.

The total spent for additions during the year was $2,350,000, and for betterments, $2,500,000; the largest items for additions being for additional main tracks and additional sidings and spur tracks; and the largest items for betterment being for bridges, trestles and culverts, and for ballast.

On June 30, 1910, of the total mileage, there was 4,927 miles of road which the company had owned for 10 years on which during that period steel bridging was increased 32,786 lineal feet, and timber bridging was reduced 87.073 feet. In 1900, of the mileage now owned, 69 track miles was laid with 80-lb. rail, there being nothing heavier than this in track. At the end of 1910 there was 1,717 track miles of 80, 85 or 90-lb. rail. The company has a considerable mileage of branch lines on which the comparatively light traffic does not require heavy rails. During the past year embankments were widened or restored to original width and grade line on 800 miles of road, and 1,378 miles of track was ballasted with gravel, of which 334 miles was not previously ballasted and 532 miles on which ballast was restored and an additional lift given.

In the last 10 years the number of locomotives in service on the Great Northern has been more than doubled, there being 1,123 locomotives in service at the end of 1910; and during these 10 years the combined tractive power of all locomotives was increased three times. The average tractive power of each locomotive is 47.72 per cent. greater in 1910 than was the average in 1900. During the 10 years, also, the number of freight train cars has more than doubled; the number in service at the end of 1910 totaling 44,283; the average capacity per car was 35.44 tons in 1910, as compared with 25.52 tons in 1900. In this connection it is interesting to note that notwithstanding the well known large increases in average train load on the Hill roads in past years, the company was able to show an average train load of 518 tons, an increase of over 16 tons from the 1909 figure. This train loading was accomplished despite an extraordinarily severe winter.

In an interview quoted in our General News Section, James J. Hill discusses the prospects of railways and of general business and specifically cites the immediate plans of the Great Northern as an example of curtailment.

The following table shows the operations of the Great Northern

in the fiscal year ended June 30, compared with 1909:

	1910.	1909.
Average mileage operated	7,020	6,808
Freight revenue	$46,675,734	$39,464,811
Passenger revenue	14,311,800	10,977,948
Total operating revenue	64,465,370	53,687,444
Maint. of way and structures.	11,773,314	9,797,370
Maint. of equipment	7,520,634	6,173,847
Traffic	922,104	745,847
Transportation	18,068,666	14,822,546
Total operating expenses	39,278,096	32,553,487
Taxes	3,570,302	2,570,372
Operating income	21,856,981	18,812,783
Gross corporate income	23,113,800	22,566,583
Net corporate income	17,791,824	17,487,434
Dividends	14,698,663	14,697,473
Transferred to fund for permanent improvement and betterment	2,319,158	2,789,961
Profit and loss surplus	774,003	.....

Letters to the Editor.

TURBO-ELECTRIC LOCOMOTIVE.

JACKSONVILLE, FLORIDA, Nov. 15, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I notice in some of the recent magazines a brief account of the completion and successful trial of a turbo-electric locomotive in Glasgow, Scotland. I am disposed to claim a little of the credit for the suggestion, at least, of htis application of steam and electricity to locomotive power. In your March 25, 1904, issue you will find a letter of mine suggesting with some detail this very use of the turbine in locomotive construction, together with some reasons why it ought to be an economic success. The editor also made some suggestions by way of comment on the letter, so, perhaps, he is entitled to part of the credit for the great idea. A few weeks or months later I saw somewhere the statement that a distinguished Scotch engineer was working on this problem with great hopes of success. I immediately determined to keep my eye on him and note his progress. It has taken six years, but he has done it at last. The turbo-electric locomotive bids fair to be a success. This claim of mine for any credit in the matter is, perhaps, a trivial affair, but there is at least some satisfaction in being able to say "I told you so!"

J. LOGAN IRVIN.

TICKET OFFICE ACCOMMODATIONS IN BOSTON.

New Haven, Conn., November 18, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The *Railway Age Gazette* of November 11 contains a letter entitled, "A Friendly Criticism of Poor Passenger Service," and one part of the letter refers specifically to an alleged defect in the method of caring for sleeping-car passengers at the Back Bay station in Boston. The writer of the criticism misunderstands the situation, and this part of his criticism is not warranted. The ticket agent at the Back Bay station can and will receive an order for space in sleeping car, unaccompanied by money, and this space will be reserved up to 15 minutes before the leaving time of train. If the party making the reservation does not call for it by 15 minutes before leaving time of the train, then the space may be sold to any other passenger who requires it.

S. HIGGINS,
General Manager, New York, New Haven and Hartford Railroad.

[Presumably the grievance of our correspondent was in that 15-minute limitation. He wanted to be able to come back 15 seconds before leaving time, protecting the company by leaving money with the agent.—EDITOR.]

SAFETY APPLIANCE STANDARDS.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I was very much interested in the editorial on safety appliance standards in the November 11 issue of the *Railway Age Gazette*, and believe that it covers the ground carefully. My opinion is that the government has shown a disposition to be fair all the way through. It is to be regretted that the members of an association like the Master Car Builders' have not lived up to their own recommended standards better than they have, and no one is to blame more than they are as a body, if in any way the new standards are not satisfactory.

We were informed time and time again in the past in our conventions by Mr. Moseley, secretary of the Interstate Commerce Commission, that it was his ambition some day to see the M. C. B. standards adopted by the government. Knowing this, what have we done? We have adopted some features as standards, and others as recommended practice. It is no wonder that the government, with the very competent set of inspectors that were selected to draw up these rules, were compelled to insert some standards into the new rules concerning which the Master Car Builders in the past had allowed its members to do as they pleased. The government was looking for uniformity, and where matters were left as standards and the word "preferable" used, which allowed some railways to have ladders on the ends, and others on the sides and at the center of cars, also brake shafts to the right or to the left of the center of the car at the ends, no one should be surprised that it took the action that it did. The committee of railway men that appeared at the hearings, say that the very best of feeling existed at all times between the railway men and the government inspectors, and the disposition was to be fair towards the railways.

The Master Car Builders' Association and other railway associations have learned a good lesson in this; that is, when standards are adopted, stick to them. It is a well known fact that when the M. C. B. 3¼ in. x 7 in. journal was adopted as standard, some of the roads disregarded it and manufactured an axle that was one inch longer than the M. C. B. recommended practice. Also, when the M. C. B. standard bearings, for 3¼ in. x 7 in. and 4¼ in. x 8 in. journals were adopted, some roads manufactured journal bearings entirely different from the M. C. B. standards, and which did not even interchange with them.

I might go on and mention many other cases where our association has adopted standard sizes and locations of safety appliances to which some roads have paid no attention. I might also refer to the M. C. B. standard freight coupler; the committee has made recommendations as to the size of the coupler and the formulae and tests to be given them, so that we might get the very best material and couplers on the market. How many roads to-day are buying their couplers strictly to the M. C. B. recommended practices?

I am a firm believer in standards, but when we, as an association, adopt standards, we should see to it that they are followed. However, we are now compelled by the law to follow certain standards. The railways that have ignored the recommended practices of the M. C. B. Association can now see the folly of their ways.

MASTER CAR BUILDER.

GOOD PASSENGER SERVICE.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The recent articles on politeness and on making railway service convenient and valuable to the user have stirred me to make a little addition to the lists.

Recently my wife and our little child went to *C*, a big city, for an extended visit. I accompanied them to the little country station at *A*, and went with them on the train to the next town *B*, where there was an easy chance for me to return. The train was late, but the station agent courteously volunteered to let us know when to look out for it, and at the time for its approach he advised as to where to stand on the platform to be the most conveniently situated for the passenger coaches (other than Pullman, second-class and smoking) on a ten-car train. This was without suggestion of any reward. He wanted nothing but the knowledge that the road's patrons were comfortable. In the train the conductor took our tickets and asked: "Are you going direct to *C*, Madam?" The answer being "Yes," he glanced at me and kindly informed me how many minutes I could have to wait in the car with my family at *B* before the train would leave there (my ticket reading to *B*) and then went about his work. My wife tells me that on arrival in *C* she found herself courteously assisted by the brakeman and by a uniformed station

employee in the handling of a considerable amount of hand baggage, while she looked after the child.

A few days later I followed them, and was also heavily laden with hand baggage. I took the train at *A* at a different hour, and another man was on duty, but I was given the same advice in regard to where to take the right car in the momentary stop of a semi-express train. Also, the man who threw the semaphore picked up some of my luggage and carried it to the right location. At the car steps a brakeman directed me to the car at the right where there would be more room for my luggage. I left the train at a good sized city before reaching *C*, and waited for the local train that would take me to the desired suburban station. Knowing that the time table had been recently changed, I asked a station porter—the nearest railway employee—when my train would leave, and he said he would look it up. In less than two minutes he returned with the information. As I neared my destination the conductor came along to tell me that the train was running on a new track and I must get out at the side opposite that usually taken, and further suggested that it might be well to be ready when the train stopped, so as not to be swamped by the crowd which usually boards the train there.

These were pleasant experiences, but the finest of them was when the conductor showed the good breeding and fine intelligence to address my wife as "Madam" instead of as "Lady."

There is another side to the picture. The man at the baggage transfer office at the station in the big city (*C*) charged my wife $1.50 instead of the rightful 95 cents for company's work in taking two trunks and an extension case to a house in the suburb.

Let me mention some instances of carelessness recently observed at different places, for I am a man who knocks about considerably on the cars. I saw a passenger train taken across a drawbridge without any railway man looking at the bridge, when the rules distinctly require the conductor and engineman to make a personal examination and be sure that the draw is closed before the train goes on the bridge. I saw a freight train enter the main line from a branch while the signals were set for safety for trains on the main line. I saw a passenger train stalled between stations and the man carrying a flag to the rear went less than 60 rods from the train, while just beyond him a sharp curve shut him from the view of any other train that might approach in case the block signal had not worked properly. All three of these were seen in as many weeks. C.

[Train men and station men who use the term "lady" in the place of "madam" ought to be fined a day's wages. We have thought of proposing this to the superintendents, but as they themselves are mostly responsible for the prevalence of this bad habit we have restrained ourselves. This little item alone would betray our correspondent's letter as coming from New England, although we have omitted the date line. New England origin is also indicated by other things; for that region (it is believed by some) is notable for the use of poor signaling as well as good English. Where else do they do without drawbridge signals on lines traversed by ten-car express trains? However, not to be too severe, we must note that the incident of the flagman is of a kind observable everywhere in America. But it is the good things in this letter—not the bad—that we want to emphasize. Most readers will say that the peculiarity about those courteous station employees was that they *desired* to make passengers comfortable. Where there is a will there is a way. Quite possibly, too, the passenger was of that temperament which evokes good treatment. But desire or no desire, every station man should be trained to aid passengers in finding their proper place on the station platform *before* the train arrives. In cold weather, especially, the station agent who wants to make himself popular can do nothing more conducive to that end than so to inform passengers that they will not have to search wildly along a row of a half dozen closed vestibule doors before finding an opening where they can break into the train. Sending passengers out of the waiting room to freeze on the platform several minutes before the train arrives is another good thing to avoid.—EDITOR.]

JOHN M. FORBES AND THE MICHIGAN CENTRAL.*

BY HENRY G. PEARSON.

I.

THE BUILDING OF THE MICHIGAN CENTRAL.

In the spring of the year 1842 Charles Dickens, being then in the course of his American travels, hired a four-horse stage coach to carry him from Columbus, Ohio, north to Tiffin, where he expected to take a railroad for Sandusky. His description of the journey epitomizes the difficulties of travel by land in the Middle West of those days. "At one time we were all flung together in a heap at the bottom of the coach, and at another we were crushing our heads against the roof. Now, one side was down deep in the mire, and we were holding on to the other. Now, the coach was lying on the tails of the two wheelers; and now it was rearing up in the air, in a frantic state, with all four horses standing on the top of an insurmountable eminence, looking coolly back at it, as though they could say, 'Unharness us. It can't be done.' The drivers on these roads, who certainly get over the ground in a manner which is quite miraculous, so twist and turn the team about in forcing a passage, corkscrew fashion, through the bogs and swamps, that it was quite a common circumstance on looking out of the window to see the coachman, with the ends of a pair of reins in his hands, apparently driving nothing, or playing at horses, and the leaders staring at one unexpectedly from the back of the coach as if they had some idea of getting up behind. A great portion of the way was over what is called a corduroy road, which is made by throwing trunks of trees into a marsh, and leaving them to settle there. The very slightest of the jolts with which the ponderous carriage fell from log to log was enough, it seemed, to have dislocated all the bones in the human body. It would be impossible to experience a similar set of sensations, in any other circumstances, unless perhaps in attempting to go up to the top of St. Paul's in an omnibus. Never, never once, that day, was the coach in any position, attitude, or kind of motion to which we are accustomed in coaches. Never did it make the smallest approach to one's experience of the proceedings of any sort of vehicles that go on wheels."[1]

In this passage, though it wear the guise of fiction, is found the reason why the development of the Middle West waited for the day of railway transportation. Where the region touched the Great Lakes on the north, the Ohio on the south, and the Mississippi on the west, commerce crept along its borders, but the interior was impenetrable. The richness and stickiness of the soil which could produce such wonderful crops made the business of raising them hopelessly unprofitable, for the cost and the difficulties of getting them to market were almost prohibitive.

What happened in Michigan was typical of the whole western situation. In the early days of its statehood it had planned and partly built two lines of railway running across its lower peninsula from east to west. So severely was the State shaken by the panic [of 1837], however, that in spite of its heroic efforts to meet its obligations, the word Michigan became a scarecrow to Eastern capital. As the years went on and it proved impossible not only to complete the two roads but even to procure the money necessary to keep them in repair, it grew plain that the State must get rid of them. One, the Michigan Central, 145 miles long, ran from Detroit to Kalamazoo. The other, the Michigan Southern, also ran nowhere, but achieved the same result with less effort, being only 75 miles long. The roads together had cost $3,500,000. Accordingly, placing its dilapidated property on the bargain counter, the State waited for customers.

*From a forthcoming biography of John M. Forbes, by Henry G. Pearson. Mr. Forbes died October 14, 1898, at his home in Milton, Mass., at the age of 86. At the time of his death he was chairman of the board of directors of the Chicago, Burlington & Quincy and he had been a director of that road since 1857. His service with that company and with the Michigan Central made him a prominent railway man for fifty years, but his activities were those of a financier and capitalist rather than as an active administrative officer. He was a millionaire before he became interested in railways. He is chiefly remembered for his high personal character, his public spirit, and the wise use that he made of his great wealth.

[1] American Notes, Ch. xiv.

At last, in 1845, the roads attracted the attention of two young men, both Easterners, who had gone West, and both persuaded not only that the day of prosperity for the West was about to dawn, but that, if the right means could be taken, Eastern capital could be brought to look upon a Western road as a profitable investment. One of the men was James F. Joy, a graduate of Dartmouth College and the Harvard Law School, who had come to Detroit and was waiting for his practice to grow. The other was John W. Brooks, superintendent of the Auburn & Rochester Railroad in New York. They believed that if the Michigan Central could be rehabilitated and completed for the remaining third of the distance to Lake Michigan, it would prove a profitable investment. * * * Brooks went East to interest capitalists. Good luck led him to the counting room of John M. Forbes, in Boston. Forbes, who came of a good Boston family, his uncles, James and Thomas H. Perkins, being prosperous merchants engaged in the China trade, had been sent by them, when he was only seventeen, to be a clerk in the house in Canton which did their business for them. Beginning as the youngest of all the clerks, and having no money of his own, he was able in seven years to win what in those days was a comfortable fortune. At the age of twenty-four he came back to Boston and established himself in the business of building and loading fast ships for the China trade. Successful as his ventures were, his true wealth was his intelligent and inflexible honesty, his power of inspiring others with confidence in himself—a striking proof of which was his being intrusted with the investment of half a million dollars belonging to Houqua, a mandarin of Canton—his love of exciting and intense work, and above all, an impulse to turn his powers into some channel where they should serve not only his own interests but also some work of public utility.

Forbes went so far as to employ Daniel Webster to draft a charter embodying the wisdom that had been gleaned from Eastern railway experience, and to send Brooks back to Michigan to secure the passage of the charter by the legislature.

The discussion of this act, with its momentous consequences to the exhausted treasury of Michigan, was naturally the chief event of the legislative session of 1846. But so ignorant were both the public at large and the legislators themselves concerning railway charters that the point on which local interest centered was the danger that the pagan capitalists of the East should attempt to run trains "on the Sabbath"; and every day petitions bearing on this point were presented. When, however, the time came for voting on this section, amendments were offered requiring that the corporation should observe the other nine commandments also, and that the directors should attend church at least twice every Sunday, and the section was laughed to defeat. The true guardian of the State's interests proved to be the governor, Alpheus Felch, an able and honest executive, who more than once during this session had to restrain the legislature from giving away to corporations the property of the people. Thus the charter as passed retained for the State a measure of legislative supervision and control. Yet even so Brooks and Joy knew that, with the price of the road fixed at $2,000,000, they had not the worst of the bargain.

By the act of incorporation, the Michigan Central Railroad Company was granted the property of the road forever, but the state might repurchase it after a lapse of twenty years, and after thirty years the legislature might alter, amend, or repeal the charter. For the first four years the road was to pay a tax of one-half of one per cent, after that, of three-fourths of one per cent on the capital stock and loans for construction purposes. Its annual report to the secretary of the state was to contain tables showing its financial condition, its physical condition, and the amount and character of its business. The amount of the capital stock was set at five million dollars, with permission to increase it to eight million.

The rates existing under state management were to continue in force until July 1, 1848, from which time a reduction of twenty-five per cent was to be made on flour and grain; the tariff for no article was to be higher than the average of the tariffs charged for that article on the Boston & Lowell, the Boston & Providence, and the Boston & Worcester Railroads, during September and October of 1845. An exception might be made if the secretary of state of Michigan, the auditor, and the attorney-general gave their consent. There was provision for a commission to determine what was the average rate on the New England railroads, and in case of disagreement a final decision was to be rendered by the court of chancery. Furthermore, not oftener than once in ten years the legislature might require such a commission to review all the rates of the road. The road was required to "transport merchandise and property . . . . without showing partiality or favor, and with all practical despatch." The maximum passenger tariff was fixed at three cents a mile. No publication of rates was required; nevertheless, for eight years, from 1850 to 1857 inclusive, these tariffs were given in the annual report of the railroad.

As one person after another looked into the facts about this worn-out railroad in the wilderness, it became plain that it was indeed a bargain. Brooks' report showed that there had been an increase of one hundred per cent. in the receipts within the past year, and there was every prospect of even more satisfactory returns when the road should be built across the state and properly equipped. Finally, there was the assurance that it was to be controlled by eastern capitalists of proved honesty and ability. Advantages such as these were made the most of by a man like Forbes, who had vision, will, and above all, the faculty of "pitching in." As the six months allowed for the formation of the company drew to an end, his tense and tireless efforts brought success. "I shall, I hope," he wrote when it was all over, "have cause to look back upon this September as one of the best spent months of my life." He had, indeed, opened the door upon his true career.

On September 23, 1846, the Michigan Central Railroad took possession of its property. Forbes was president, having consented to take the office only because he found that otherwise the necessary capital could not be secured; but he arranged to put the burden of his work on the treasurer, George B. Upton, to whom he made over his salary. John W. Brooks, at Detroit, was to have charge of the running of the road.

Promising as were the prospects of the Michigan Central, the road itself, as Brooks' report made clear, was a shabby piece of property. The one hundred and forty-five miles of track from Detroit to Kalamazoo were in bad condition, and fifty-six miles more were needed to complete the line to the nearest point on Lake Michigan. There were only four passenger "depots" along the line, and at Detroit nothing but a small freight depot and an engine house, both inconveniently situated at some distance from the water front. The value of the rolling stock was $68,000, the largest single item being $4,000 for a locomotive of twelve tons. The track, like that of all the early railways, consisted of beams of wood six inches square, to which were fastened strips of iron half an inch thick by two and a quarter inches wide. The beams were fastened to cross ties laid three feet apart, which in turn were laid upon undersills, "the whole being supported upon short blocks of different lengths, varying according to the distance between the bottom of the undersills and a firm foundation."[1] On the first thirty miles out of Detroit, the wooden part of the track, which had been in use for eight years, had never been renewed, and was naturally much decayed.

* * * *

It was at the time of this meeting that Forbes and some of his associates received their first lesson in practical railroading. They traveled on the road, explored so called harbors on Lake Michigan in the search for a western terminus, went on to Chicago, and returned by steamer through the Straits of Mackinaw. Forbes, a born traveler, with a keen eye and a zest for

[1] Brooks' Report upon the Merits of the Michigan Central Railroad as an Investment for Eastern Capitalists.

every experience, described the trip in a journal letter to his wife. It deserves a place here for the picture it gives of the rawness of the country which the railroad was to do so much to develop.

By the summer of 1847 it was clear that an extension of the road would be profitable, and Forbes and his associates explored the country. In a letter to his wife he wrote:

STEAMER EMPIRE, Mackinah, June 11, 1847.

"We reached Detroit 1.30 in the night and landed in the mud, slept an hour or two, and had to get up and go to find T. Howe; Brooks, our mainstay, having gone West. We decided to follow and started at eight or so on our railroad . . . .

"For the first few miles out of Detroit the country was dreary; flat, with a great deal of surface water, through forests mostly, but dense and melancholy ones; water under foot and huge decaying trees lying about; the trees generally tall and with no foliage until near the top.

"We found the road in a most deplorable condition, the iron broken up often into pieces not a foot long, and sometimes we could not see any iron for some feet, only wood; in other places short pieces of iron, almost athwart ships, but our protection was in its being so short that no snake heads could reach the cars. This bad road lasted about eighty miles, the bad country about thirty, when we came to a little drier soil and passed through several flourishing villages."

The letter goes on to describe the country through to the lake. From Kalamazoo it was necessary to go in a barouche drawn by four horses. The travelers sat up half the night talking with the engineers about the routes. Not daring to drink the water found in the wilderness, their tongues were parched as with fever. St. Joseph, which is spoken of as a "celebrated city," was reached after a drive of twelve hours. It was now a group of unoccupied houses, its fame having died out very soon after it was built. From Michigan City they took a steamer to Chicago, where, on their arrival at five o'clock in the afternoon, they found it "hotter than Tophet." Mr. Forbes continues:

"Established ourselves at an immense Hotel, and, the pangs of thirst being unbearable, we here broke into lake water astonishingly, and happily without bad effect. Mr. Odgen came for us at 6 or 7 in his carryall, and took us to drive about the town. Some of the houses are on a bluff (like that at Brooklyn) looking out on the blue lake, and it was lovely at sunset beyond imagination; few trees however, and the ground under foot dampish, being called wet Prairie."

In the early days of the road the locomotives had proceeded with such obliging caution that livestock could browse between the rails in entire safety. Naturally, when under the new management the speed was accelerated, with the consequent destruction of cattle, the outcry was at first great. But the balm of damages easily obtained opened the eyes of the settlers to new tactics; and soon they took their pigs to the railroad track to market. As a counter move, Brooks, when the line of track had been properly fenced in, issued notice to the effect that hereafter the road would pay only one-half the value of any animal killed. The contest was then joined. Trains found their progress blocked by logs on the tracks, and on grades the rails often greased, so that the passengers had to get out and work their passage. In his Reminiscences Forbes tells the story of the struggle. * * *

"In the county next west of Detroit the law-breakers were so strong that it was said no judge nor jury dared to convict any of the prominent men among them; and it was soon evident that here was the battle-ground between order and disorder. Mr. Brooks at once took his measures with his characteristic foresight and decision. When almost powerless, he maintained the best truce possible, protecting his property and trade by special police raised from his own men, and usually running a hand-car ahead of every train, as I remember was still done the first time my wife and I went over the railroad. But Brooks laid his plans for more thorough work. His shrewd lawyer sent on colonists to settle on the line of road in that country as farmers, and at the same time to get evidence against the conspirators, who had determined either to destroy or control our road. He also quietly took measures to get the legislature to change the general law, so that criminals could, when circumstances justified it, be tried in counties other than those in which their offences were committed. While thus accumulating evidence and getting ready for enforcing his rights, he went on extending and rebuilding the road with vigor. The conspirators were led by a man named Fitch, supposed to be quite rich for the country, who boasted that no court would give a verdict against him or his men. Misled perhaps by Brooks' quiet methods, he extended his operations from putting obstructions on the track and firing upon trains to burning wood piles and depots, destroying at one fire $75,000 worth of property. . . . When in due time Mr. Brooks' plan was ripe, he one night sent a train-load of special officers, chiefly enlisted among his own men, and captured thirty-five of the conspirators without a blow being struck or any resistance attempted. They expected to be carried only to their county town, there to be bailed out; but, when they approached Detroit, they found for the first time that the law had been changed, and that they could be tried in a place where justice was possible. They hired William H. Seward to come from New York and defend them, which he did in a speech worse than any made by himself or any other demagogue in this country. The trial lasted all summer, Fitch and one or two others dying in jail, it was said in consequence of medicine taken to produce illness and prolong the trial in hopes of a disagreement of the jury. Mr. Brooks' measures for getting evidence and working up his case were so good that in spite of Seward's help and of all the disadvantages of a great corporation prosecuting individuals and farmers, all the worst members of the gang were . . . . convicted . . . . It was the great railroad trial of this century, and settled many practical questions for all Mr. Brooks' successors in railroad building and management. . . ."

THE FREIGHT CAR SITUATION.*

In considering the freight car situation this Fall, two facts stand out prominently: First, the railways own many more freight cars than they did last year; second, the railways are making their cars go farther than they did last year. The surpluses are about the same as they were last year, while the shortages are considerably smaller. It is fair to presume from this that the reason the shortages are so small this year is that cars are moved better and shortages are filled with surplus cars which have been moved for quite a distance. These two facts are about all we absolutely know today as to the situation, but they are sufficient to warrant a statement that the railways did more in the month of October, 1910, than in the month of October, 1909; which is the same thing as saying that the commerce of this country is greater this fall than it has ever been.

The railway business of October, 1909, did not greatly exceed the business of October, 1907, but there had been no net increase in the number of freight cars in the two years. The only reason why the railways did more in the fall of 1909 than in the fall of 1907 was that they had better cars; they loaded them heavier and moved them faster. Now we have more cars, and the increase in the number of cars alone should account for quite an increase in business. If we have improved over our record last year in the movement of cars and in the loading of cars, the increase in business will be still greater.

The above is based on the figures of the American Railway Association, which show for July 1, 1909, a total of 2,100,000 freight cars in service and 40,000 under contract. On the 1st of July,

*From an article by Arthur Hale, in *American Industry*.

1910, there were 2,270,000 freight cars in service, with 120,000 under contract. We do not know just how many freight cars there are now, but there are certainly many more than last fall.

The statements as to surpluses and shortages, published semi-monthly, show very clearly that we are doing business this year on a less margin of surplus cars than we did last year. It also shows that our worst situation this year from the car supply standpoint is about the same as the best we had in the summer of 1907. * * * After the panic of 1907 we had two years of unusual car surpluses, and it is probable that the figures shown in the published statements have been normal only since the summer of 1909. It seems quite evident that if the railways had not made these large purchases of new cars in the last year there would have been a very serious car shortage this fall.

I was called upon to write an article on this subject a year ago. At that time I said that a comparison with the two prior years as shown would seem to indicate that the shortages would not increase much longer, and the surpluses would increase very soon. The prediction was a very fortunate one. The shortages did decrease and the surpluses increased until a number of the railways were seriously affected by the extreme severity of last winter. The weather of the coming winter will doubtless have much to do with the record made. An increase of one degree in temperature on the larger railways in the North is equivalent to an addition of many engines to its available supply.

In my paper of last year I estimated that the shortage of October 13, 1909, which was somewhat more severe than the worst shortage this year, meant that 13 per cent. of the freight offered was delayed one day or more before it could be shipped. I said that this was all that the shortage meant. It did not necessarily mean any restriction of production except in the trades where absolutely no storage is provided before shipment. The same statement appears to be true for this year, except that the per cent. of freight delayed is smaller. There is a car shortage felt in various parts of the country, just as there was last year, and just as there has been in every recent year excepting 1908 (even then there was a shortage of 13,000 cars reported on one date, although the surplus on the same date was over 100,000). Such shortages simply mean that empty cars cannot be moved from remote points to promptly fill orders.

Even in the regions where the coal strike has suspended production of coal for so many months, the efforts of the railways have been very successful in the way of filling orders, and supplies from other and unusual sources appear to have postponed all danger of a coal famine.

The supply of freight cars is not affected by the usually accepted law of supply and demand. If it were practicable for the railways to raise or lower their rates in accordance with the demand for the commodity which they are furnishing, namely, "transportation," or, in case of freight transportation, freight cars, they could, by proper advance in rates, readily keep the freight car supply well within the demand. Such a course is not practicable, for many reasons, which need not be detailed.

It is a pity that this fact is not more generally appreciated. Its full appreciation might go far to mitigate the annoyances felt by shippers when a sudden demand for freight cars is not met with an impossible increase in the car supply. As matters stand, whenever there is a car shortage the railways are obliged to deal with shippers who, not fully understanding the situation, feel that they have a grievance, and this makes even more difficult the task which is before the railways of dividing an insufficient car supply without discrimination. In this task the railways have been very successful. So far as I can learn, all serious complaints of discriminations in freight car distribution date back to the extreme shortages of 1906 and 1907. In a few months we shall have detailed figures giving us an exact record of what has been done this fall. I feel quite certain that these figures will prove that in their large increase in freight equipment and in their improved handling of that equipment the railways will have done all that could have been expected to meet the present emergency.

RATES AND COST OF COMMUTATION.

The accompanying chart was made for use by the New York, New Haven & Hartford at the hearings on commutation rates before the Interstate Commerce Commission and the New York Public Service Commission, First District. One or two of its most vivid features will at once attract attention, notably in showing that not until a distance of 23 miles from the Grand Central station is reached does the commutation rate equal even the terminal charge and tollage of the New Haven company. At the other end of the service, New Haven, the commuter's rate of about 23 cents per trip compares with a total cost of about 73 cents.

The chart shows the relations between the average receipt per passenger per trip in the commutation service of the company and the cost of the service. The line of the average rate paid represents the receipts from all classes of commutation tickets sold, divided by the number of trips sold on such tickets. The elements composing the total cost are the fixed charges and operating expenses, given in detail and in total amounts. This cost has been ascertained by dividing the various elements of the total cost of the service by the average number of commuters per car and per train. It will be noted that the cost of the service, unlike the average rate paid, does not vary directly with distance, but rises in progressive steps—each step representing a group of commuters residing within the limits of suburban runs. It will be clear, also, that the cost of the service within each group is determined by the maximum length of the train run provided for each group; cost must be computed to the end of the run and is not affected by the actual distance traveled by each commuter. The fixed charges and operating expense forming the total cost are thus classified into suburban zones, the limit of each zone representing the terminus of the suburban train run. Each extension of the zone adds to the cost, and the cost per commuting passenger is practically unaffected by the actual distance traveled by him.

A factor, however, that would affect the chart is the proportion of tickets unused by commuters. This would raise the rate somewhat. The proportion unused at the lower end of the line, where the volume of commutation is largest, is comparatively small; the proportion is larger at the New Haven end, where the volume of commutation is small. This factor would raise the average paid probably about 25 per cent., but still leave that average far below the total cost.

The argument of the commuter based on original "moral contract" and on the theory that commuters fill a gap of empty seats has been met by the New Haven by allegations of a great increase of terminal charges; of the greatly increased volume of passenger traffic now filling cars that carried empty seats when the old commutation rates were fixed and of the greatly increased costs of general operation. Slight depressions in the line of average rate—at Noroton and between Milford and New Haven—are accounted for by variations in the type of commutation ticket sold.

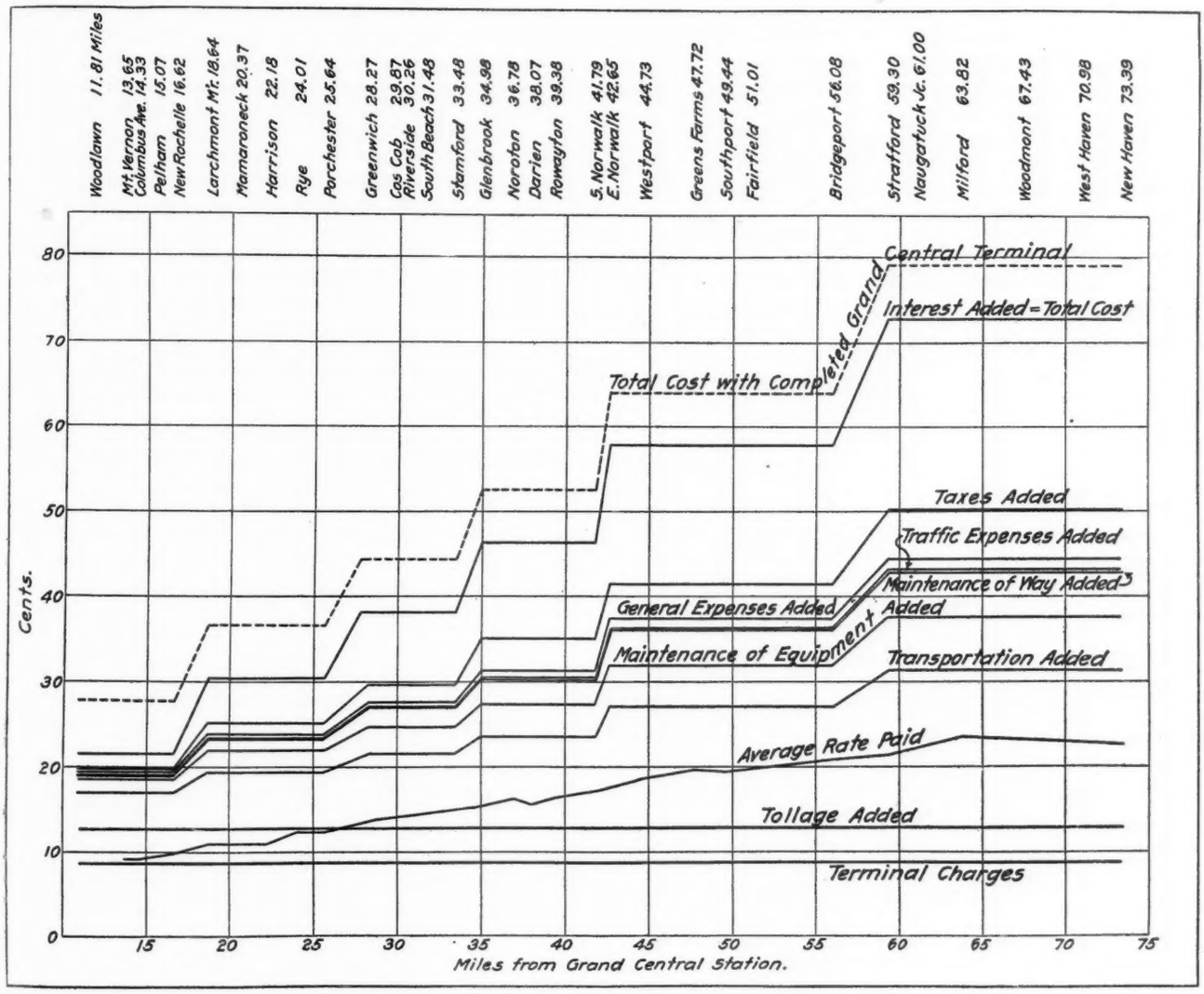
The accompanying tables represent the chart in figures and give out tabulated information bearing on the subject. The first totals are based on cost of terminal to date; revised totals, on additional fixed charges and operating expenses of completed Grand Central Terminal.

COST OF SUBURBAN SERVICE (COMMUTERS) PER RIDE.

For year ending April 30, 1910.

	New Rochelle.	Pt. Chester.	Stamford.	So. Norwalk.	Bridgeport.	New Haven.
Terminal charges	$0.0872	$0.0872	$0.0872	$0.0872	$0.0872	$0.0872
Tollage	.0394	.0394	.0394	.0394	.0394	.0394
Transportation	.0436	.0673	.0879	.1078	.1433	.1861
Maintenance of equipment	.0159	.0246	.0322	.0382	.0491	.0619
Maintenance of way	.0048	.0147	.0233	.0297	.0411	.0532
Traffic expenses	.0004	.0007	.0010	.0017	.0022	.0028
General expenses	.0022	.0037	.0050	.0078	.0104	.0134
Taxes at 1½ per cent	.0043	.0132	.0209	.0380	.0408	.0566
Interest at 6 per cent	.0174	.0527	.0836	.1123	.1631	.2265
Totals	$0.2152	$0.3035	$0.3805	$0.4620	$0.5766	$0.7271
Add for completed terminal	.0624	.0624	.0624	.0624	.0624	.0624
Revised Totals	$0.2776	$0.3659	$0.4429	$0.5244	$0.6390	$0.7895

Maximum revenue per ride sold, year ending Dec. 1, 1910, in each suburban zone	New Rochelle. $0.0989	Pt. Chester. $0.1226	Stamford. $0.1484	So. Norwalk. $01701	Bridgeport. $0.2075	New Haven. $0.2256
Rate per mile (old)	.0059	.0048	.0044	.0040	.0037	.0030
Rate per mile (new)	.0077	.0064	.0054	.0050	.0050	.0050
Regular passenger rate (2 cents a mile) (old)	.35	.55	.70	.85	1.15	1.50
Regular passenger rate (new)	.40	.60	.75	.90	1.20	1.55
New commutation rate	.1275	.165	.18	.2083	.28	.3667



Rates Paid and Cost of Commutation Service, per Trip.

APPORTIONMENT OF TERMINAL AND TOLLAGE CHARGES.

	Passengers—Regular.	Passengers—Commuters.
Terminal	$0.1361	$0.0872
Tollage	.1182	.0394
	$0.2543	$0.1266
Add for completed terminal	.0972	.0624
	$0.3515	$0.1890
Number per car	29.42	47.63
Number per train	206	263
Number cars per train	6.99	5.74

Average number cars, all trains, 6.52.

	Regular Passengers—Cost per trip.	Regular Passengers—completed terminal.
New Rochelle	$0.3631	$0.4603
Port Chester	.4710	.5682
Stamford	.5661	.6633
South Norwalk	.6662	.7634
Bridgeport	.8069	.9041
New Haven	.9917	1.0889

The Department of Public Works, Chili, recently received bids for the electrification of a railway between Valparaiso and Santiago. The first bid received was from the Westinghouse Electric & Manufacturing Company.

TESTS OF RAIL JOINTS.

BY M'LEOD THOMPSON.

Laboratory tests of rail joints have been made in great numbers, and numerous methods have been followed in the attempt to make a test on a rigid table represent the elastic roadbed found in actual service. It therefore seems most important for all who are making tests, or who are using the results of tests, to look carefully into the actual track conditions under a rolling load, in order that the rigid test on the machine may be made to conform as nearly as possible to the elastic road conditions.

Figures 1 and 2 are exaggerated for better illustration, and show the action of the flexible track structure, composed of rails, joints, ties, relative to a line representing the normal position of the bottom of the ties. The long waves in the track structure between the wheel loads bend upward between the loads as far, if not farther, from its normal position, than it deflects downward immediately under the loads. The reason for this is that there is nothing between the load points to resist the upward bending caused by the lever action of the rail bending over the ballast, while in the downward bend of the rail directly under the load the ties under and to each side of the load afford a somewhat elastic resistance which is distributed from one wheel bearing to the next. The amount of the upward and downward wave depends principally on the stiffness of the rail and splice bars, also on the solidity of the roadbed, the magnitude of the wheel loads

and their distance apart. The spacing of the ties relative to the joint is a very small factor, since, with the usual tie spacing, the stiffness of the rail is much too great to bend between the ties. It bends over a series of ties in a long wave. Wheel loads may be distributed on the roadbed by a very stiff rail with few ties, or by a light rail with a larger number of ties. If there were a space of four or five feet between ties, without intermediate support, the rail would then bend perceptibly between the ties; but this condition is not approached in practice, and we must consider, in testing the rail joint, the long wave between the wheel

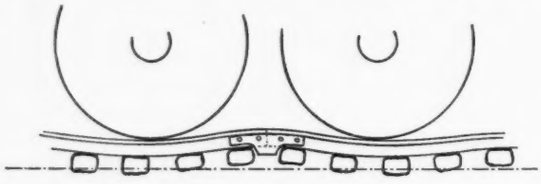


Fig. 1.

loads, rather than the short spacing between the bearings of the rails or splice bars on the ties. On account of these reverse wave actions of the rails, splices and ties in the ballast, it is apparent that it does not make any difference whether the joint is suspended or supported, so far as the stiffness of this rail and tie structure is concerned. The upward bend is as important as the downward deflection, and the splice bars can extend over one, two or three ties without perceptibly affecting the stiffness of the superstructure one way or the other. Neither does it make any difference whether the joint is in the form of a chair resting on the ties or an angle bar clearing the ties. The function of the entire fabrication of the joint, whatever its construction, is to furnish stiffness at the two rail ends regardless of the ties. The joint follows the long wave of the rail and carries the ties up and down with it in the same manner as does the rail. The ties are not solid bridge abutments, but are yielding bearings which are driven into the roadbed and rise above it in proportion to the stiffness of the rails and joints, the general character and rigidity of the roadbed and the spacing and magnitude of the wheel loads.

The principal point, then, to consider is the bending of the spliced rail in a long wave extending over a number of ties, rather than the bending between ties, or between load centers approaching anywhere near to the tie spacing. The damage to a rail joint is caused by these long lever actions of the rail ends bending in one direction and then in another, causing fatigue of the metal to a point where it is finally fractured by a blow. It is this long leverage of the rails, when the joint is between the loads, that breaks the top chord of the ordinary angle bar, which has only 30 per cent. of the stiffness of the rail. It is also a fact that the further up the splice moves between the loads, on account of its weakness, the further down it will allow the un-

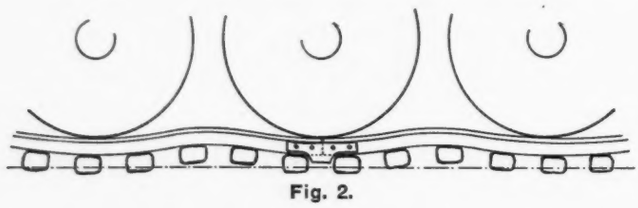


Fig. 2.

broken rail to go under the loads. A rail or splice of sufficient stiffness to prevent any bending between the loads would also prevent any deflection under the loads. On the other hand, the beam depth of the T-rail used on steam railways is very small for the loads which it carries, when we consider that it does not have any rigid support. The elastic roadbed throws a great strain on the rail and splices, and allows a long up and down wave movement between adjacent wheels, the length of this wave ranging from 5 to 6 ft. on a locomotive, or on a car-truck, to 20 to 60 ft. between the trucks of a car. In the latter case it has often been noted, when the rail and splices are tightly spiked to the ties, that the ties are lifted from ⅛ in. to ¼ in. out of their normal seat in the ballast. The stiffness of the rail and splices is not great enough to bind the ties down to their place between the loads, and the tendency is for them to bow up, and either to carry the ties with them or draw the spikes. If ties are firmly frozen into the roadbed, the track becomes very rigid, some of the ties then furnishing stiffness to the rail structure, while adjacent ties, which may not be frozen solid, do not. This, in turn, permits a lack of uniformity and abrupt deflections and kinks in the rail. The result is, that the rails are broken, especially at the joints, where deflections are much greater, if the joint is not as stiff as the rail; in which case the holes in the roadbed under the joint ties are deeper and the amount of deflection depends on the drainage of the sub-grade and the variable frozen condition of the water accumulated in the holes.

If the stiffness of the rail and splice largely govern the extent of the up and down wave deflection, it is not hard to imagine what the conditions would be at the point where the superstructure had no stiffness. Figure 3 represents this condition by showing the rail ends as they would act without splice bars, or as they would be if the splice bars were broken, or the bolts loose. This same condition would exist as a downward deflection, if the rail ends were directly under the load, and would cause damaged rails and excessive tamping. The remedy, of course, is obvious: make the splice bars as stiff as the rail, disregarding entirely their relation to the ties, so as to approximate the conditions which would be found if we could have continuous rails.

It will thus be seen that the rail joint should be tested for stiffness without regarding its bearing on the ties. The rail ends should act as long levers and should rest on widely spaced bear-

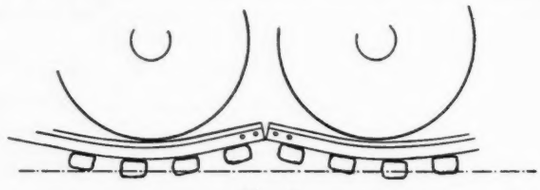


Fig. 3.

ings, in order to represent the long wave and yielding bearings of the track. The yielding tie bearings on the roadbed distribute the load over a long wave, while on the testing machine the bearings are rigid and the load concentrated at the middle. The test of a rail joint then involves the vital question: What distance between rigid centers should be used to represent these yielding conditions of the track? The most severe strains in the rail and splices of the track are caused by two adjacent driving wheels of a locomotive. Taking the average distance between these drivers as 72 in., we find, by formula, that the same maximum load could be distributed along a 100-lb. rail mounted on 72-in. centers as could be concentrated on the rail midway between 36-in. centers. It would seem, then, that we can approximate the resilient track conditions in making tests on a rigid table by choosing 36 ins. as the distance between centers, and it is suggested that this distance of 36 in. be adopted as a standard, with 40 in. and 30 in. as the absolute maximum and minimum which should be used to give approximately the same action on the testing machine as is found in the track. This distance between centers is, of course, the vital feature in tests of any kind, but there are other details which should be included, and which would vary somewhat according to the type of joint under test.

The following details have proved valuable in many tests which have been made, and especially in the tests which have been used in the development of our own joint.

POINTS TO GOVERN TEST.

1. Rail ends, bolt fastenings and splice bars should be selected promiscuously from stock and not prepared especially for test by manufacturers.

2. Rail ends must be spaced not less than ⅛ in. apart.

3. The rails, including assembled joints, should not be bolted or fastened in any way to the testing machine during the test.

4. Preliminary to the test the nuts should be drawn up tight by repeated application and release of a 15,000-lb. load. This method of tightening should be followed until all looseness is taken up and until its bearings on the testing machine have assumed their maximum indentation for a 15,000-lb. load. The number of releases of load for tightening purposes should be the same for all joints tested. This process of tightening and settling will assure a deflection in the test which will accurately represent the stiffness of the joint, and which will not include deflection due to indentation of the bearings and taking up of loose parts.

5. Each joint should be tested to destruction without release of the load, and the deflection should be noted at 5,000-lb. intervals.

6. Each joint should be fitted up with its own rail ends so that it may be carefully examined and measured at any time after the tests have been completed.

7. Two tests should be made of each type of joint; in one test the rail should be in its normal position with the load on its head, and in the other test the rail should be inverted and the load applied on the bottom of the rail base.

POINTS FOR OBSERVATION DURING TEST.

1. Careful observation should be made to determine the parts of the bar from which the outer scale spalls off, and the loads at which spalling off occurs should be recorded.

2. Borings should be taken from each bar for chemical analysis.

3. Observe any indications of lifting of the bars away from the top of the rail base at the outer edge, due to buckling of the bar at the point where the outwardly extending member joins the vertical member.

4. Bars having depending flanges should be calipered between the middle and also between the ends of the lower edges of the depending flanges at 10,000-lb. intervals, in order to determine the extent of spreading or clamping action of these flanges. Deflections of the lower edge of the depending flange should be measured at 10,000-lb. intervals in order to record the vertical movement of this member.

TRANSPORTATION AND TRAFFIC IN ENGLAND.*

BY LOGAN G. M'PHERSON.

II.

Until the opening of the Liverpool & Manchester not one railway had been constructed for the conveyance of passengers, the first intention being to provide for the carriage of goods at a cheaper rate than by canals and to accommodate the traffic of the great coalfields and mineral districts. The first carrying of passengers was on aristocratic basis. The railway directors did not conceive that it would pay to carry a large number of passengers at high speed and low fares. Their best trains were therefore reserved for the rich, while the poor were carried at low speed, at inconvenient times and in uncomfortable carriages.

The introduction of machinery and the application of steam to almost every industry dislocated the labor market. There was more or less change in the processes of nearly all manufacturing. Certain labor was thrown out of employment, but wide demand was created for labor adjusted to the new methods. The great industries of the country were in many instances moved to other locations which they would benefit by the changed conditions: factories of the kind that had previously sought the banks of canals and rivers were now built along the railways. The steam engine, whether working by water or by land, enabled the manufacturer to distribute his goods more efficiently and therefore more widely. The demand for labor in building the railways and then in their operation was a large factor in the readjustment of supply to demand, which gradually regained a condition approaching equilibrium. Both directly and indirectly steam locomotion effected a great improvement in the condition of the laboring classes. It came at a time when capital was abundant and the labor market overstocked. It provided a new and almost illimitable field for the investment of the one and the employment of the other.

Steam locomotion, both on water and land, leading to a wider distribution of products, also necessitated and made practicable the bringing of raw material and supplies of various sorts from greater distances. In the earlier period of England's development the value of the exports probably exceeded that of the imports. In the earlier part of the nineteenth century they were practically at the same amount, which rapidly increased year by year, especially after the introduction of the railways. About the middle of the nineteenth century the natural resources of the island became inadequate to supply raw material for the manufactures that were in increasing demand, England at that time being the one firmly established manufacturing country of the world. The farms of England were also inadequate to supply the food for the continually increasing portion of the population that engaged in manufacture. The necessity for the import of raw materials and of foodstuffs caused the imports to overbalance the exports of manufactures and of coal. Of the imports the foodstuffs began to exceed the raw materials of manufacture in the early seventies and the increase has continued.

RATE REGULATION.

As the maximum tolls that could be charged for the use of the canals were from the first specified in the original canal acts, so also were the maximum tolls that could be charged for the use of the railways specified in the original railway acts, it being supposed at the beginning that carriers would provide transportation on the railways as they did on the canals. It was soon found, however, that a railway company would have to be the transporter as well as the provider of the track and structures of the railway, and therefore in later charters there was a maximum charge for the use of the railway and for the transportation combined. The conditions attendant upon the development of commerce after the introduction of railways quickly led to the lowering of nearly all rates below the permitted maximum. To secure traffic between one port and another in competition with coastwise vessels rates were made lower than those between stations not having water communication. For example, to keep traffic from going between Liverpool and London by vessel the railways put into effect rates that would bring such traffic or a goodly portion of it to their rails, but such reductions were not applied to the intermediate traffic. Because of the long, broken coast-line of England and the great number of ports, it has been estimated that about three-fifths of the rail rates have been determined by water competition. Then, again, as railways were extended, a longer line competed with a shorter line, meeting the short-line rates between competitive stations while not making the same concession to intermediate stations. The desire of a railway company to develop the district served by it led to the making of reduced rates to markets reached by other railways from competing districts.

Classifications of freight were early adopted by the railways, later given a certain uniformity through the railway clearing-house, and further unified under parliamentary direction. At present there are eight classes. Three lettered classes, designated as A, B and C, include heavy commodities, such as coal, stone and pig iron in station to station service. Five numbered classes, designated as 1, 2, 3, 4 and 5, include merchandise of higher value likely to go in smaller quantities and needing to be loaded and unloaded under cover. Merchandise of lower value, such as raw cotton, is included in class 1, and the merchandise is graded up class by class to class 5, which includes the most expensive, such as dress velvets and cigars. With exceptions, the

*From a preliminary report to the National Waterways Commission of the United States.

rates on traffic of the numbered classes cover transportation from the warehouse or other place of business of the sender to the storeroom or other place designated by the receiver; *i.e.*, the railway company performs the cartage to the railway station at the place of consignment and from the railway station at the place of destination, the compensation for this as well as for the station service being included in the transportation rate. On the lower grades of traffic reductions from the ordinary rates per hundredweight are made for shipments of two, four and six tons. Especially reduced rates are now and then made for trainloads.

The seeming anomalies in the long and short haul charges and other preferences in the developing rate structure of the English railways early attracted public attention, giving rise to the same outcry as to unjust discrimination that persisted for so long in the United States. These and other matters entered into parliamentary discussion. The course of legal enactment and other governmental procedure in connection with the regulation of the railways has been so admirably summarized by W. M. Acworth, a distinguished writer on railway economics, in a statement before the committee on interstate commerce of the senate of the United States, in its hearing on May 9, 1905, that there can be nothing better than to quote that summary here:

"The first important act, I think, that affects English railways is what is known as the 'cheap-trains act,' which was introduced by Mr. Gladstone as long ago as 1844. One consequence of that act was that it regulated what was probably the most important existing rate in the world. I suppose a yearly traffic of $100,000,000 is carried on that rate to-day. That act provided that one train per day should carry third-class passengers at two cents per mile, and the fact is that to-day in England every train carries third-class passengers at that rate.

"This same act of Parliament provided that the state was to be entitled to take over any railways, constructed after the passage of the act, at twenty-five years' purchase, on the supposition that the annual profit would be not less than 10 per cent. Practically that act has not been put into force yet.

"With respect to rate regulation proper, the first act that we need to notice was in 1845, called the Railway Clauses Consolidation Act, and it applies to every new railway that is constructed. One clause of that act is known as the Equality Clause, which requires that every railway company shall charge the same rate for traffic carried the same distance under the same conditions. Practically no two kinds of traffic are carried the same distance and under exactly the same conditions. Therefore a clause that merely insisted on equality when all the circumstances were exactly the same had very little effect.

"Nine years afterwards, in 1854, Parliament enacted what is known as the Railway and Canal Traffic Act of 1854. Under that act the railway companies were put under obligations, if the circumstances were different, to make such a difference in the rates as was proportional to the difference of circumstances.

"The early act said that, circumstances being equal, charges should be equal. The later act said circumstances being different, the difference is to be proportional to the difference of circumstances.

"That act was left to be applied by an ordinary law court, the court of common pleas. That court, being an ordinary law court, showed, I think one may say, a considerable distaste for dealing with what were not strictly law questions.

"It is, of course, familiar to this honorable committee that the question always raised was, What are similar conditions? What are differences of conditions that justify a difference of rates? At the bottom that is not a legal question, but an economic or business question. From its point of view the court showed considerable distaste, and I think one may say did not encourage complaints of that kind to be brought before it.

"Then, after nearly twenty years, in 1872, there was an inquiry into this matter. There was considerable depression of trade following on very great prosperity at the time of the Franco-German war, and the traders grew restive, raised many difficulties, and there was an inquiry by a very strong parliamentary committee, consisting of ten members, nine of whom were at that time, had been, or afterwards became, cabinet ministers. That committee recommended, and it was carried into effect by the act of 1873, the institution of a railway commission. That commission was not a legal court except in the sense that it could make orders, and of its three members two were laymen; there was one legal member, not of the standing of a judge, but the chairman was a layman.

"One effect of that was that the railway companies particularly protested against being subjected to the jurisdiction of what they claimed to be an inferior court. Whenever they were defeated, as they frequently were, they took the case on appeal, or by writ of prohibition, or by various legal methods, before one of the ordinary law courts, and I think one might say that as a rule, certainly in many cases, they succeeded in upsetting the judgment of the commission.

"Another point of very great importance, I think, in the act of 1873, was that it put the obligation upon the railways to publish every rate, perhaps not in the most effective way, but each railway was compelled to keep at every station from which it sent traffic books showing the rates at which all traffic was carried and the conditions attaching to the rate. So that in England, if a rate is complained of as giving undue preference, and it is found that somebody is getting a rate which is not published in that rate book, it is taken by the commission as almost conclusive evidence that there is something unfair about the business, and no railway company would venture to be found charging a rate not in its rate book.

"There may be cases where a special rate is justified for a certain period. For example, if an aqueduct is being constructed in a thinly inhabited part of the country where cement and iron pipes are not easily found and at hand in large quantities, the railway might give a specially low rate upon cement and iron pipes in large quantities, and then, after that demand for those articles had ceased, wipe out the rate entirely and go back to the prior rate. But, in general, all rates are published and available alike to everybody.

"Then, there being a great many complaints, not only of the railway situation in general, but of the jurisdiction of the railway commission in particular, there was another inquiry by a committee of the House of Commons, which lasted for many months, extending over two sessions, and going into the whole question of railway rates. The upshot of that was a great deal of difficulty; many bills were introduced in Parliament year after year which did not get through.

"Finally, in 1888, there was passed what is known as the Railway and Canal Traffic Act of 1888. That act did, I think, four important things:

"In the first place, it reconstituted the commission, and to get over the former difficulty that the legal member of the commission was not of sufficient status, he was made the president of the commission and judge of the high court. There is one judge appointed in England, a second in Scotland and a third in Ireland. The other two members of the commission are lay members. If the commission sits in England, the English judge presides; if it sits in Scotland, the Scottish judge presides, and if in Ireland, the Irish judge, and the other two members go to make up the court in whichever country the session is held. It was specially provided that upon questions of law the opinion of the judge should prevail. The judge sits for five years, and then may be either reappointed or his successor may be appointed. When he is not engaged in the commission court—and he is probably not so engaged more than a few weeks in the year—he is doing the ordinary legal work of the country.

"The jurisdiction of that court is, in the first place, interpreting the law as contained in private acts of Parliament, or in what are very frequently termed with us 'agreements,' that are scheduled to private acts of Parliament and of course have the same force as if they were in the body of the acts.

"They also had jurisdiction to sit as arbitrators under certain circumstances.

"I suppose the important matters from the point of view of this committee are questions of undue preference and enforcing reasonable facilities. In England we do not have many of these questions to deal with, because, you may say, the railway law has practically become known to the railway companies. Within pretty narrow limits the railway companies know how much power they have, what the court has held to be an undue preference, or what it would regard as a refusal of reasonable facilities, and they accommodate themselves to what they believe the court would regard if they were taken into court, and therefore cases do not often come before the court.

"They also have a further power, which I shall mention later.

"A second point which I think of special interest to the honorable committee, because it rests on American legislation, is section 31 of the act, which is known as the Conciliation Clause. The then president of the Board of Trade, our minister concerned with the executive control over railways, had heard of the great success of the Massachusetts railway commission, and he endeavored to introduce something on the lines of the Massachusetts commission, but instead of appointing a special body he gave the jurisdiction to the Board of Trade itself. Section 31 provides that the Board of Trade, if anybody complains to them that the railway companies are treating them in an unfair or unreasonable way, may bring together the parties, the railway company and the complainant, and endeavor to settle the differences, and then they shall report at intervals to Parliament the results obtained under that section. They have now reported to Parliament for more than ten years. They have always said that that section has been of great value, and it certainly has been of great value in all matters. If I might be allowed to say so, I do not think it has been of as much value as the Massachusetts legislation has been, for two reasons:

"In Massachusetts the sitting of the commission is public and people who are interested (not necessarily parties, but who are concerned in some question) attend the hearings, which are of themselves an education.

"In the second place, the commission gives its reasons at great length, and naturally has to give reasons to justify its action. With us, the official of the Board of Trade who hears the case sits privately. If a big question were to arise, it would probably go forward to the railway commission, who have the power to compel. Naturally, the railway companies say: 'If this is going to be taken into court you cannot expect us to show our hand to our opponents in advance, and therefore we will ask you to permit us to waive making our case before you, and reserve it until we get to the law court.' So that it is only the small cases that are dealt with under that section of the act, and, for the reasons I have given, it certainly has not the same advantage in educating the public and bringing the railway and public nearer together that has been obtained by the procedure in Massachusetts.

"Another point was an enactment that no increase of rates could be made without fourteen days' notice. I dare say that would be regarded as a very long period in America, where your circumstances are more fluid than ours, but when any railway proposes to make an increase it is bound to give fourteen days' notice before it can advance the rate.

"The act of 1888 provided that the old maximum rates should be entirely repealed and recast. Elaborate machinery was provided, with which I need not trouble the committee. To get at that matter there was held a very long inquiry by two special commissioners appointed by the Board of Trade, who sat, I think, for one hundred and eighty days, and subsequently by a joint committee of the two houses of Parliament, which sat, I think, for about seventy days. As the result of that, the whole of the maxima that had been contained in the different railway acts passed in the preceding fifty years were abolished. There were said to be 3,000 different acts, each fixing different maxima of rates. They were all abolished, and there was a compendious schedule of maximum rates imposed for each company separately. The large companies had a schedule all to themselves, with a separate act of Parliament permitting it; the smaller companies were grouped, each group supposed to be under similar circumstance, and they had a rate applying to them.

"So that every rate in England is controlled by the fact that it has to be subject to the maxima contained in the act of Parliament affecting the particular railway.

"The last of these acts was passed in the autumn of 1892, and the new maxima were to come into force in the beginning of the year 1893.

"That only left the railway companies four or five months in which to recast the whole of the rate schedules from every point to every point in the country. But I believe our schedules are perhaps more complicated than are yours, because I understand that in America the custom is not to make rates between practically every point and every other point, but to make rates only to basing points, and then to leave the local points to be added to that. With us, the country being smaller, and conditions being more stable, it is common to put into the rate books through rates from the same place upon the same articles to every other place upon the same articles. So that to recast this was exceedingly complicated and difficult.

"When the 1st of January, 1893, came and new maxima came into force, the railway companies had not finished the job, and the result was that in many cases the only instructions given to station agents were to charge the maximum rates. The maximum rates in some cases were nearly double the rates that had been previously charged for what you would call carload lots, and there was a tremendous uproar in the country. Parliament was appealed to, and the president of the Board of Trade stated publicly that he would bring the railway companies to their senses. A new committee of the House of Commons was appointed and heard evidence, and they were not apparently satisfied with the statements of the railway companies that they had not intended harm, but had only done what they had for lack of time, and they made a new limitation of railway powers, that, with regard to any rate that had been increased under this procedure that I have described or that should be increased at any future time, if any member of the public complained he could come before the railway commission, and the railway commission was not to allow the increase to take effect unless the company could satisfy them that there was good reason for allowing it.

"So that you have the railway company subject in these charges to three checks:

"First, the statutory maximum, which, of course, is not really much of a check; the statutory maximum is not likely to be charged except where there is no competition making a lower rate necessary, or where the traffic is coming in quite small quantities. So that the statutory maximum check is of no value except to local traffic for short distances and small amounts.

"The second check is that the rates must not be such as to constitute an undue preference to one trader or to one district over another. Of course, that can only apply as to an individual railway. It cannot apply beyond what the particular railway does.

"Third, the railway company must make no increase except for good cause, if anybody objects. Of course, objection is not likely to come, in practice, except where a considerable number of interests are involved.

"Subject to these restrictions, the railways remain free to make or to vary rates as they please.

"I may perhaps say, sir, that the secret rebate question is nonexistent with us. Of course, nobody can prove a negative. I do not think I have ever come across an individual who believed that there were in England any secret rebates that were of any practical importance. They may exist. If they do, probably the officials of the railway companies do not know of them. But, for practical purposes, the secret rebate question is of no importance

in England. I think there would be a universal agreement as to that.

"We have had in England, as they have had in every other country, heroic proposals. At the time of the uprising of public opinion in 1893 there werre proposals to hand over to a county court judge (who is our judge of first instance in civil matters) the power to say what was a reasonable rate. But these questions have been argued pretty fully more than once before parliamentary committees, and they have never stood the test of argument. The rate-practice history is really the history of what Parliament has enacted in the past with reference to the railway questions from time to time for just such cure or alleviation of specific ills as were brought to their attention."

It will be perceived from Mr. Acworth's statement that the conclusion reached in England in regard to the charge of a lower rate for a longer than for a shorter distance over the same line is practically the same as that arrived at by the Supreme Court of the United States, i. e., that dissimilar conditions, which include competition by rail as well as by water, must justify the lower charge for the longer distance without entailing reduction in the intermediate higher rates.

The English railways are also free to agree as to rates and to enter into pooling arrangements. Indeed, for many years much of the competitive traffic has been carried under pooling contracts and the scope of the old pools has been widened within the last two years to embrace a larger part of such traffice.

[The next installment of Mr. McPherson's paper takes up the handling of freight traffic.]

FOREIGN RAILWAY NOTES.

Press despatches from Peking say that there is some doubt that the projected loan of $50,000,000 to China by an American financial syndicate will be finally concluded. Numerous difficulties have arisen, among them being the unwillingness of the Chinese to accept a foreign financial adviser. Without such control, it is said that the promoters are unwilling to proceed.

The opening of a direct steamship service between Dairen and Shanghai has had marked effect upon trade, and the railway authorities are anxious to improve the shipping facilities of the port to the utmost possible extent. Beans and bean cake are the staple products of Manchuria. Last year more than three million piculs (400,000,000 lbs.) were exported from Dairen, which figures are double those for the previous year.

It will be recalled that at that time the South Manchuria Railway loan was concluded Japan incurred much harsh criticism from the English press on the ground that the funds obtained from English financiers were largely expended on the purchase of equipment in the United States. From what I could learn on the spot, the South Manchuria Railway authorities do not intend to lay themselves open to similar criticism again, and although part of the rolling stock is to be bought in America, I understand that nearly all the locomotives are to be purchased in England. Orders for rails are to be distributed in a very eclectic manner, English, American, Japanese and even Russian makers being on the Japanese lists.—Special correspondent of *New York Herald*.

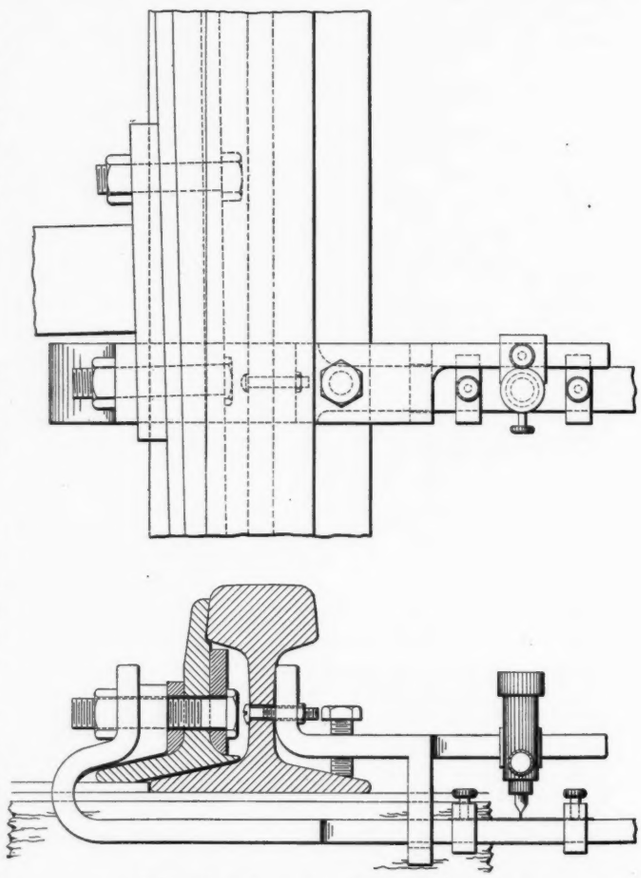
Bids are asked for building a railway from Ambato, Ecuador, to the Arajuno river, 73 miles, and for the supply of locomotives and rolling stock.

RECORDING MOVEMENTS OF SWITCH POINTS.

C. E. Knickerbocker, engineer of maintenance of way of the New York, Ontario & Western, and W. H. Harland, signal engineer of that road, have invented a deflection recorder for recording the lateral deflection of switch points under moving trains with respect to the fixed rail or track.

The object is to provide a device of few parts which may be quickly attached to any switch point and a printed record obtained of the actual lateral deflection of the switch point under a moving train. The failure of a switch point to remain in contact with the stock or fixed rail, resulting perhaps in a derailment due to the flanges of the wheels passing between the fixed rail and the switch point, may be brought about by wear of certain parts of the switch, such as clips, rods, pins, etc., or the point itself may be too weak from wear to stand the lateral pressure of a heavy train or one running at high speed.

By means of the recording device the division superintendent or other persons in charge may make tests at suitable times which will give a record of the conditions of the various switch points located on that section of the road which is under their supervision. The printed slip from the recording device will not only indicate the condition of the switches but will also give a check on the work of the sectionmen, whose duty it is to see that switches are in first-class condition and make necessary repairs or renewals. After the completion of the test the



Deflection Recorder for Switch Points.

device is removed and the permanent record of the actual working condition is filed in the office for future reference.

The arm carrying the strip on which the record is to be made is attached to one of the switch lug bolts, while the other arm is bolted to the web of the rail. The recording point is held down by a spring; after the record is taken, the set screw in the side of the barrel is tightened so that the point will not drop out when the device is removed. A separate strip of paper, or other impression receiving material, is inserted to record the movement produced by each train that passes over the switch.

Some interesting tests have been made with this device, and as a rule it was found that section foremen, in order to obtain good recording slips from the switch points on their respective sections, kept their switches in first-class condition. This is where the inventors claim that the recording device soon pays for itself—for good maintenance is obtained by the use of same, which not only increases the factor of safety, but also increases the life of the switch points and their attachments.

Shop Section.

IF you have not yet prepared your paper on Increasing Shop Output for the competition, which closes December 15, you still have time to do so. A complete announcement of the competition and suggestions as to the subjects which might properly be considered, appeared in the issue of November 4. Briefly, any paper containing from five to fifteen hundred words and devoted to any subject which has to do with the increasing of the output of a railway shop, or any department in it, is eligible for entry in the competition. Prizes of $35 and $20 will be awarded to the authors of the best two papers. Other papers which are used for publication will be paid for at our regular space rates.

THE shop kink competition, to close January 15, will include kinks of all kinds used in connection with the repair and maintenance of cars and locomotives. In other words, there is an opportunity for every department or shop of a locomotive or car repair plant, an engine house, or car repair yard, to be represented. Three kinks are required for entry in the competition, although more may be submitted, allowing the judges to base their decision on what they consider to be the best three in each collection. The best collection will be awarded a prize of $50, the second best a prize of $25; others that are accepted for publication will be paid for at our regular rates.

A CAR department competition, of which this is the first announcement, will close February 15, 1911. In order that all of our car department readers may be in position to participate the only requirement concerning the papers submitted is that they cover some subject of interest or importance to the men in that department. Here are a few suggestions from a foreman: "The car department field has hardly been touched as yet and I feel sure that every foreman has subjects which are of vital importance to him and from which we all may give and take if the opportunity were only given us to express ourselves. Following are a few suggestions: The Call of the Car Department—How can we attract bright young men to the car department? Most young men think that the locomotive department is the only field open to them for advancement. If this is so, why? Distribution of Supervision—How is the distribution of shop supervision carried on in the car department? Do we lack organization? Side Sills—What method is being followed to prevent the side sills rotting at the side doors on baggage, mail and combination cars? This refers particularly to where the sill is morticed to receive the tenon of the door post. Wooden vs. Iron Steps—Life and cost of the wooden step as compared to the iron step. Drawbar Knuckles—When is a knuckle worn out? Is it safe to use an old knuckle by reaming out the coupler and knuckle and using a larger pin? Deck Ventilators—Life and cost of the ordinary deck sash, together with ratchets, weather stripping and deck screens for them, compared to the stationary sash with no weather stripping, no screens and a patented ventilator for ventilation. Roofs on Passenger Cars—What covering is the best, or have we experimented enough to find a substitute for canvas? Leaks on Roofs of Passenger Cars—Every foreman of passenger car shops has sweat blood over this proposition. What is done to prevent flashings breaking at deck posts? Is the flashing now commonly used on passenger cars as good or better than the old style wooden strip formerly used at the story sill? Supplies—Methods of handling supplies for repairs and construction. Machinery—The value of the combination saw, band saw and planer in the coach shop. Facts and statements showing saving of labor. Increased Output—This is a very broad subject and one whereby the management could get in closer touch with the cutting edge of their tools. How can the supervision share in the general increased output of the shops financially? It is only human to expect that any plan whereby a foreman and his assistants can add to their monthly wages by increased output will appeal to them. The plan of increasing the salaries of foremen has only accomplished this partially, but a per cent. or bonus whereby they could add to their wages would be a constant incentive to increase the shop output and thereby its efficiency, as the foreman would naturally get after the man who did not push his work and instruct him properly in the best way and manner. In this way the shop organization would stand out before the management in a very different light, as the shop's output from the day such a plan was put into effect, as compared to the old method of driving the departments, could be very easily kept track of." There are hundreds of other subjects of equal or greater importance. A first prize of $35 will be given for the best paper and a prize of $20 for the second best. Other papers which are accepted for publication will be paid for at our regular space rates.

FIVE contributions were received in the car repair kink competition, which closed November 15. The judges were not able to examine these in time to announce the winners in this issue. The competitors are: A. G. Pancost, draftsman, Elkhart, Ind.; F. Rattek, Brighton, Mass.; Theo. Rowe, general foreman, Great Northern, Jackson street shops, St. Paul, Minn.; S. S. See, planing mill foreman, Norfolk & Western, Roanoke, Va., and W. H. Snyder, assistant general foreman, New York, Susquehanna & Western, Stroudsburg, Pa.

WHILE the collection of shop kinks from the Lehigh Valley shops at Sayre, Pa., takes up a much larger amount of space in this number than is usually given to that subject, it covers such a wide range of shop work—including the smith shop, car department, machine shop, erecting shop and boiler shop—that it will appeal to practically all of our shop readers. Moreover, it illustrates to a striking degree the great number of labor saving devices which must be developed in a large modern railway repair plant in order to meet the demands for greater output and higher efficiency. As a matter of fact, modern, up-to-date machinery cannot be used to the best advantage unless it is surrounded and equipped with special facilities for handling the work. The forging machine, for instance, which is today an absolute necessity in a railway smith shop of any size—but which was practically unknown in such shops ten or twelve years ago—cannot be used without special dies, and it requires far more ingenuity to devise and construct these than was formerly the case when the work was done by hand or even on bulldozers. The car wheel lathes, which give such wonderful results in turning steel tired wheels, were not nearly as efficient before special arrangements were made to handle the wheels and axle in and out of the lathe. Turret lathes, which have revolutionized shop practice on certain classes of work, require far more ingenious tools than formerly required when the work was done on simpler machines. A few years ago a large shop plant was built and equipped with new and modern tools and equipment, with the expectation that it would immediately show a great improvement in output and efficiency as compared to older shops. It really made a much

poorer showing and it took several years to bring about the desired results. Two things were found to be necessary in order to accomplish this. A better and different type of organization was required than in the older shops and also the development of special devices and equipment for use with the new tools. A most important factor in this development was a bright and ingenious assistant machine shop foreman who gave practically all of his time to this work. It is, therefore, not surprising that the Sayre shops have been able to make such a generous contribution of kinks, for it is several years since they were enlarged, and the new tools which have been added to the equipment have apparently been carefully studied with a view of getting the best possible results from them.

SHARP FLANGES ON STEEL FREIGHT-CAR WHEELS

IN turning steel tired wheels or rolled steel wheels a large part of the steel removed from the tread is due not to flat spots or other irregular shape in the tread itself, but to the necessity of restoring a full flange. This requires a turning of the tread far below that required for a full circle, and the apparent waste of steel in heavy turnings is large. When a steel flange is worn to the limit of 15/16 in. thickness, or to the point of having a flat vertical surface extending 1 in. from the tread, it requires about ¾ in. in radial thickness to be removed from the tread in order to obtain a full flange, and the value of this material at 75 cents per 1/16 in. is $9.00.

The comparative hardness and wear of chilled cast iron flanges and of rolled steel flanges has not been carefully investigated, but it is our impression that steel flanges wear more rapidly than those made of chilled iron, and the most frequent cause for condemning cast iron wheels is sharp flanges. On some railways 50 per cent. of the wheels removed are taken off because of worn flanges and on other lines this percentage is as high as 85. Under such conditions the more general introduction of steel wheels will materially increase the cost of freight car maintenance and some method of reducing flange wear should be devised. It does not seem like a correct mechanical process continually to turn off large masses of steel from the tread of a wheel after it is truly circular in order to obtain a full flange, and some method should be devised to avoid this waste.

A considerable saving in flange wear on locomotive driving tires has been obtained by the use of flange lubricators, and they are coming into more general use on railways where there are numerous sharp curves and on switching engines whose principal service is in yards where they are continually running on cross-over tracks. But the use of a lubricator for freight car wheels would grease the track so much as to reduce adhesion and interfere with the efficiency of the brakes.

With the improved methods of welding by which broken locomotive frames are repaired and the tubes and tube sheet made a solid structure, it might be possible to weld enough material for a new flange on a sharp steel flange and thus avoid unduly turning down the tread. The wearing qualities of cast iron wheels have been improved by special treatment which increases the hardness of the tread and flange, and in a similar manner the tread and flanges of steel wheels could be made harder than the body of the wheel so as to prolong the life of the wearing portions.

An attractive field for invention might be found in the design of a composite steel wheel with a separate flange bolted or riveted on. The reduction in the amount turned from the tread would prolong its life three or four times, and the saving thus obtained would be much larger than the cost of the new flanges required. The first impression of such a suggestion may be that it would not be safe, but it would be easily possible to test such construction and ascertain its resistance under static loads, or by the drop test for live loads, and in this way a safe composite wheel tread and flange might be designed. The steel tired wheel, which is always used on passenger equipment on account of its safety, is a composite structure in which the whole tire is fastened to the wheel center by bolts, rivets or rings, and a bolted or riveted flange might be made equally secure.

The powerful wheel lathes that have been recently developed remove steel from worn wheels with marvelous rapidity, and the restoration of flanges by this method has become a comparatively cheap operation so far as labor cost is concerned, but the expense for the steel thus wasted is large. This rapidity and low cost in turning steel wheels tends to cause the cost of steel to be disregarded by the lathe operator, and a larger amount is wasted than there was under the old conditions with the slower and less powerful wheel lathe.

We have called attention to this part of the cost of wheel maintenance, in the belief that if it is recognized and measured by correct records the necessity for a more economical method than the usual practice will be apparent and some improvements in steel wheel construction will be made.

THE BELPAIRE BOILER AT HOME AND ABROAD

THE economies that have resulted from the adoption of superheating in locomotive practice excited so much interest at the International Railway Congress at Berne, Switzerland (*Railway Age Gazette*, August 5, 1910, page 222), that in the discussion of the reports on "Improvements in Locomotive Boilers" other important matters relating to firebox construction and safety were not made prominent, and no definite conclusions as to the best type of firebox were reached.

American locomotive designers have been influenced only to a slight extent by foreign practice, but they should regard with favor certain details of boiler construction which receive general commendation by prominent railway men of most other nations. Any doubt as to the superiority of a certain type of boiler construction should be greatly reduced, if not removed, when it is generally adopted by the large railways of other countries. Henry Fowler, chief mechanical engineer of the Midland Railway of England, reporting for Great Britain and the Colonies, said, "the greatest change in boiler construction that has taken place in recent years was in the largely increased use of the Belpaire firebox, the majority of newly designed locomotives having been of this type." One chief advantage derived from the change was the removal of crown bars, which left the space over the firebox comparatively clear. The Belpaire system of direct staying with flat top crown sheet provides full threads on the crown bolts. It secures more steam and water space and a larger area of evaporating surface for a given width of box than is obtainable with the round top firebox. The stresses in crown stays and plates can also be more accurately calculated. Its cost is slightly more for the same capacity than the round top boiler and its weight is somewhat greater.

Mr. Nadal, chief engineer of the French State railways, reported that the principal French railways had adopted Belpaire boilers for all their recent locomotives. The Belpaire boiler was first used in Belgium, having been designed by the former chief mechanical engineer of the Belgian State railways, and it is the prevailing type in that country. It is also generally used on the Prussian, Saxon and Bavarian State railways, and in Russia, Norway, Sweden, Denmark and Switzerland. The railways of India have about 8,000 locomotives. The secretary of state of India referred to the British engineering standards committee the question of the standardization of the locomotives of India, and in its recent report that committee recommended the Belpaire type of firebox for adoption as a standard for all future construction.

H. H. Vaughan, who reported for America at the Berne congress, stated that the type of boiler generally used in the United States and Canada is that with the round top firebox, usually called a radial stayed boiler. He said that a few of the large roads, such as the Pennsylvania and the Great Northern, are using the Belpaire as an adopted standard, while others, including the Canadian Pacific, use that type more or less extensively. From the showing thus presented, it must be con-

cluded that while the Belpaire boiler may not now be used on the majority of the locomotives of the world, yet the majority of newly designed engines have that type of boiler. This is the most prominent point in regard to boiler design that was brought out in the reports on boiler improvements at the Berne congress.

CHEMISTRY IN THE FOUNDRY

A RATHER remarkable paper was read before the Canadian Railway Club at its September meeting. Not that the data presented was really new, but because it indicated a tendency that has become quite marked within the past few years. The subject was "Iron Castings, Their Defects and Remedies." Instead of handling the matter in the old-time method and looking to the practicalities of foundry work, coupled with a "careful selection of pig and scrap," without giving any clear idea as to how this careful selection was to be exercised, the author, Robert Job, struck at the real crux of the matter and put the main part of the burden of the responsibility for the woes and successes on the chemical composition of the charges and the output, which, of course, included that of the coke used in the melting.

That such a paper should be presented before this club is not at all surprising, when it is remembered that the Canadian Pacific employees are a large factor in the club's membership and that the study of the chemical composition of the cast irons used has reached a high state of development at the Angus shops. The author is not, however, a Canadian Pacific man. Again, it must not be inferred from the above that chemical composition was set down as the sole cause of success or failure. Cupola manipulation, the tempering of the sand, the ramming of the molds, and the quality of the facings were all given due credit for the influences that they might exert. These we have heard before, but too little attention has been paid to the other points emphasized by Mr. Job, probably because the average foundryman is not in a position to grapple with them. He has no chemist at his elbow to point out and detect faulty compositions and so has been obliged to depend solely on the general character of certain brands of iron that give good results, and when hardness or blowholes appeared he had to depend largely upon guess to locate the cause. He might even be a most skilful practical foundryman, and yet fail to realize that the cause of the hardness of his castings is due to an excess of sulphur or manganese, or because of a low percentage of silicon. Or, worse still, his hard iron may not be the "result of any one cause, but may be due to many widely different conditions."

Sulphur appears, according to Mr. Job, to be one of the worst of the evils to be contended with, and he urges that "proper care in the selection of the materials" should be exercised, and that this should be of such a nature as to fix the proportions of silicon, phosphorus, sulphur and carbon, so that they should combine to produce the quality of casting desired. And above all the foundryman should look well to the quality of the coke that he is using, and see to it that the quantities of sulphur and ash are kept at a minimum, "for obviously it is sheer waste of time and money to pay great attention to the quality of the pig iron and then accept a coke that may contain thirty times as much sulphur as is present even in a poor grade of pig iron."

It is all very well to urge this "careful selection," but what is the foundryman away from sources of chemical information to do? Railway foundries are not usually away from such a source and their remedy and relief lies in sampling every car load of coke and iron, and having it analyzed for at least sulphur in the first case and for sulphur, silicon and manganese in the second, to which an ash determination for the coke may well be added. Then pile each carload lot by itself and work from these known piles and do not trust to brands. Ordinarily any single carload of pig will probably come from the same heat and the results can be depended upon to be fairly uniform, but any furnace, no matter how well it may be run, will vary its output from day to day, and the brand which is drawn from it will present wide variations in composition, especially in the silicon and sulphur contents. This method of handling a cupola is so exceedingly inexpensive in the apparent cost, and is so economical, when the savings in output are considered, that it is strange its value has not been universally recognized.

As for those foundries that are not associated with a company employing a chemist whose salary disappears in a general expense account, it is quite possible to obtain analyses at such a low figure that when the cost is pro-rated over a carload of iron or coke, it becomes insignificant. There is, therefore, no reason why any foundryman should be troubled with an excess of those impurities that make for bad castings, and his failures may be laid at his own door.

As stated at the outset, the significant thing about Mr. Job's paper is the fact that it sets forth the value of a knowledge of the chemical composition of his materials to the ordinary working foundryman, who has been rather more disposed, up to the present, to place a greater reliance on his own practical skill in foundry manipulation and knowledge of irons than upon these other things that he has been apt to regard as ultra scientific refinements, but which are now coming rapidly to the front.

APPRENTICESHIP.

THE railways were well represented at the recent meeting of the Society for the Promotion of Industrial Education at Boston, although the title of supervisor of apprentices was practically unknown on railways four or five years ago. Among those present were C. W. Cross, superintendent of apprentices of the New York Central Lines, and his assistant, Henry Gardner; F. W. Thomas, supervisor of apprentices of the Santa Fe; Martin Gower, of the Canadian Pacific; W. B. Russell, now director of the Franklin Union at Boston, but formerly assistant superintendent of apprentices on the New York Central Lines, and G. M. Basford, of the American Locomotive Company, who fired the first gun in the interests of modern railway apprenticeship in an address before the Master Mechanics' Association in 1905. The apprenticeship problem in the mechanical department of the railways has not been fully solved, but a tremendous advance has been made during the past few years, and just as fast as weaknesses develop they are being remedied. Splendid practical results are apparent wherever it has been given a fair trial.

MECHANICAL ARTICLES DURING NOVEMBER.

THE following articles of interest to mechanical department readers, and to which Shop Number readers may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since that of November 4.

Safety Appliance Standard. Editorial comment on these standards as finally adopted by the Interstate Commerce Commission.—November 11, page 910.

The Western Railways and the Locomotive Engineers.—November 11, page 910.

High Speed Locomotives at the Berne Congress. More attention should be given to the details of design of high speed locomotives.—November 11, page 912.

Heat Treatment of Axles. Communication.—November 11, page 916.

Electric Locomotive for Freight and Switching Service. The Transit Development Company.—November 11, page 927.

Test of Jacobs-Shupert Firebox. An elaborate test was made to demonstrate that boilers with this type of firebox are much safer than the ordinary type in case of low water.—November 11, page 965.

The Survival of the Exhaust Bridge. The increase in the diameter of smokeboxes and the necessarily reduced height of outside smoke stacks has brought about a condition which seems to be improved by the use of exhaust bridges.—November 11, page 993.

Flue Failures. Abstract of a paper presented before the Western Railway Club by J. W. Kelly, foreman boiler maker of the Chicago & North Western at Chicago. Fewer flues and better spacing have improved the boiler efficiency.—November 25, page 1,000.

The Limit of Elasticity. A method to determine this point by temperature measurements.—November 25, page 1,101.

Letters to the Editor.

LENGTH OF WRENCHES.

Worcester, Mass., November 5, 1910.

To the Editor of the Railway Age Gazette:

Referring to the letter in the *Railway Age Gazette* of November 4, on page 842, would say that for ordinary work on the nuts specified we believe that the following wrenches are most satisfactory and the safest to use. For ¾ in. and ⅞ in., the 12 in. wrench; for 1 in., 1¼ in. and 1⅜ in., a 15 in. wrench; and for 1½ in. to 2 in., an 18 in. wrench.

Of course, there are places where a longer wrench might be used, but on new work it is not advisable, as the longer leverage gives the erector a chance to exert undue strain on the bolt to its great detriment. We believe that the practice of using lock washers is far better than tightening nuts after they have been brought to a full bearing and have taken up the load they are intended for. It is possible, of course, to lengthen any wrench by a piece of pipe, but it is rarely good practice and the extension is generally needed only to loosen rusty or damaged bolts. If your correspondent refers to set wrenches (drop forged spanners) he is correct in his contention that the handle furnished is generally too short for the work.

We suppose you know that the shortness of the present drop forged wrench handles is due to excessive competition and a continual reduction in the price of these tools. In addition the working length of the handle is further shortened by furnishing double ended wrenches for erection work, thus saving the cost of one wrench in the eyes of the purchasing department. The double ended wrench is all right in some places, but it is not a satisfactory tool to use continuously unless it is long enough to give sufficient leverage for its largest opening.

COES WRENCH COMPANY.

HIGH SPEED TOOL STEEL.

Pittsburgh, Pa., November 2, 1910.

To the Editor of the Railway Age Gazette:

In looking over an old number of the *Railway Age Gazette*, July 23, 1909, page 135, I find an article on The New Tool Steel. It makes reference to an English engineering paper which states that there is absolutely nothing in the nature of a revolution in the high duty steels whose remarkable properties we have been enjoying for the past ten years. These steels have been classified as high speed steels. The article refers to an eminent steel maker who illustrates his point by referring to a man who discovered a new drink which turned out to be whisky and soda, with twice the amount of whisky.

I am inclined to believe there is something revolutionary in the composition of high speed steels, especially those that reach their maximum cutting hardness between 600 and 650 deg. Centigrade, a quality that was never secured in tool steels until after vanadium had been admitted into their composition. You mention the era of carbon tool steels, according to F. W. Taylor's classification, as extending up to 1894, self-hardening tool steels following from that date until 1900, and new high speed tool steels beginning with the opening of the new century and continuing to date.

It is true that there was no revolution as long as carbon, tungsten and chromium were used, but when steel makers succeeded in producing tool steels that were so superior in their qualities and that lasted so long in service that it seriously cut into the purchase of new supplies and resulted in steel makers withdrawing these particular brands, or saying nothing particularly about them, it certainly seems that a revolutionary period had been reached.

There is no known element that could have produced these results other than vanadium, and it was through the addition of vanadium to the original combinations that the revolution was completed. Now that vanadium is coming before the metallurgical world in such prominence, would it not be well to have its services in tool steels brought to light and more openly acknowledged, if for no other reason than for knowing the facts in the case, and doubtless finding other applications with like revolutionary results?

GEORGE L. NORRIS,
Engineer of Tests, The Vanadium Sales Company of America.

EXPANSION IN LOCOMOTIVE BOILERS.

Media, Pa., Nov. 19, 1910.

To the Editor of the Railway Age Gazette:

In D. R. McBain's paper on Inequality of Expansion in Locomotive Boilers, found in the Proceedings of the New York Railway Club, the claim is made that the outer sheet, or cover, of the firebox expands more than the inner sheet, or the firebox proper, and this explains the breakage of staybolts and the fracture of the sheets. The outer sheet is exposed to a temperature due to a steam pressure of 210 lbs., or, say, 395 deg. F., while the inner sheet is exposed to the temperature of the hot firebox, 2000 deg. F., and when the heat transmission is resisted by mud or scale its temperature is liable to be higher than that of the steam or water on the opposite side. I should therefore suppose the firebox would expand the most per lineal foot, but as the outer sheet is about 10 in. longer its total expansion might be greater than that of the inner one.

In regard to the cracking of the firebox sheet and its relation to the longitudinal riveted seams in a three-plate firebox, I should explain the condition of stress as follows: A firebox made in three plates would necessarily have a riveted seam or joint at each side; from this fact, the strains could not be neutralized no matter by what formation, on account of the construction being strengthened longitudinally by the riveted seam. From a compression test of a section of the seam or joint with equal section of the plate, it would be found that the section with the joint or seam would be practically double the strength of that of the plate, which explains why neutralization cannot take place. Such being the fact, the extra strength of this riveted seam virtually acts as a longitudinal stay between the back firebox plate and the firebox tube plate, whereas in a firebox made with one plate there are no obstructions to the strains being neutralized on account of the formation.

W. H. WOOD.

EFFICIENCY.

Hoboken, N. J., November 27, 1910.

To the Editor of the Railway Age Gazette:

I presume that all mechanical department officers and railway shop foremen have read the accounts of the rate hearing in Washington, as published in the daily papers. We must all realize that there is much to be desired in the way of higher efficiency in the operation of our departments and shops; but the roads have grown so rapidly that we have had all we could do to perfect the organization to secure the necessary output, and have had little opportunity to attempt to develop the so-called scientific management. Most industrial concerns are in the same boat as we are; nor are we at all sure—and the annual reports do not prove—that in the one instance where a betterment engineer was employed in the mechanical department of a railway on a large scale, that the results were entirely satisfactory. If so, why was he not allowed to complete his work? As a matter of fact, to fully install the scientific management will require at least a generation, if not more. Thousands of men must be carefully trained to develop and carry on the work, and even at the best, this will be a slow process and the results will not be apparent for years.

WALTER MACALISTER.

Care and Selection of Shop Equipment.

SECOND PRIZE.

SELECTION AND MAINTENANCE OF MACHINE TOOLS AND SHOP EQUIPMENT.

BY E. T. SPIDY.

Instruction Card Inspector, Canadian Pacific, Angus Shops.
Montreal, Can.

The above title covers such a wide range, and has so many aspects that I propose to deal with one only, and that the one which will appeal to the majority of shop engineers today—those whose shops are already equipped with machinery. As the care of machines and also the selection of new tools has to be dealt with by all shop engineers, to assume that we were about to start a new shop would require a deal of thought and inquiry of a different character from that of keeping a shop, already equipped, up-to-date and in good condition. The new shop question would prove highly interesting reading no doubt, but there are more men who need to know more about "how to know what they want, and how to keep it when they have got it," than there are men who want a completely new shop laid out for them.

The Selection of New Machine Tools.—The keen competition today calls for a larger output from machines than ever before. This can only be coped with by instituting a high standard of upkeep of machines. This, then, I believe is the goal before us. Having decided that we need efficient machines, let us consider how we can obtain them. It is a specialist's duty to note and to see that work done on a certain machine may not be done more quickly on another. Applying this rule wherever possible, we find that almost daily we can advantageously transfer some job or other from a chuck lathe to a boring mill, or from a slotter to a miller, and so on, or that by doing work in batches instead of singly we can increase the output with decreased cost. By this means we gradually find that we have more work for certain machines than it is possible to do in the required time, and it becomes obvious that we need an extra machine. By a survey of the work in hand we should have no difficulty in arriving at a conclusive and final decision as to the type and size of machine tool required.

Having decided on the machine, and having fixed it in the shop ready for action, do not be in too much of a hurry to start it. Of course it is realized that the sooner it is running the sooner it will save its cost. I have seen a machine brought into a shop and immediately set to work before the foundation (such as it was) was hardly set. In less than a week it was reported that there was a heavy vibration with anything like a high speed and that the bearings were getting dangerously hot. In such cases the manufacturer is invariably charged with "faulty design." This is perhaps only human nature, although hardly fair, but with the machine in question it was found necessary to remove and reset it on a better and more settled foundation. Truly a case of false economy. Maximum output cannot be expected at once (although it often is) and a machine should be gradually worked up to its maximum. Then, when it is "up to the mark" keep it there and do not allow it to fall off. A machine will give greater satisfaction always if kept up to its maximum than one that is continually working off odd jobs and never doing a regular grade of work. The man in charge of the machine should be allowed to know his machine thoroughly, and all information concerning it should be given him, in order that he may know what is expected from it, and consequently from him.

Repairs.—The operator should be made to report the slightest defect he notices, and that defect, however small, should be attended to at once. Efficient output can only be obtained from efficient machines. What may be a small defect today may be a serious fault if allowed to go on, and the ultimate cost of the repair will be all out of proportion to the cost of the small defect, if repaired when first reported. Too often the repair gang is too small to handle the repairs necessary to efficiency. Men in charge of machinery will do well to study this repair question deeply.

Study Advertisements.—A shop engineer should make it his business to study all the machinery advertisements available, and his company should help in this respect by supplying current literature on this subject. There are many cases, in which by buying a special machine for a job, a great reduction in the cost per unit may be obtained. Present day facilities given by engineering magazines render this by no means a difficult task, and the benefits are enormous.

Machine Tool Equipment or Accesories.—In dealing with the equipment of machine tools, I do not believe in doing a job by halves. If we expect good work we have got to have good tools, and it does not pay to have good machines using old or inefficient tools of all descriptions. Give a man good tools and expect him to turn out good work, but it is folly to provide a good first class machine tool with high speeds, etc., and give a man tools that will not stand up under the speeds. It is difficult to convince the engineer on this point every time, but experience will tell its own tale, if allowed the test.

Lubrication of Machine Tools.—The lubrication of machines is not considered seriously enough. Men are apt to be wasteful with oil by using it for other purposes than that for which it is intended, but it does not do to cut down the supply definitely to one can a week, as a certain company did. It is probable that it is the machine and not the man that will go wasting, if there is any choice. Rather keep a record of how many cans of oil each man uses and you will soon locate the wasteful ones. Main bearings of machines (especially high speed machines) will profit immensely by a treatment of flake graphite mixed with the oil occasionally. The properties of this substance are, I believe—except in the automobile industry—comparatively unknown. But let any engineer judiciously experiment with it, and take a record of the life of the bearing or machine, and he will soon convince himself of its value. Flake graphite can now be obtained that is free from all grit. This in the early stages of its adoption for automobile use was its great failing.

Care of Small Tools.—Every shop with any thing like an up-to-date tendency has its tool stores with a system of checking tools in or out. Checking by means of brass checks is, I believe, the best and most popular method. The tools should be overhauled regularly, and nothing should be allowed to rust for want of a piece of oily waste occasionally. This may seem an unnecessary statement, but one needs to see a good system (as it was once my misfortune to helplessly see) to realize that but for the strict enforcement of such trifles as these, everything would have been well. Pneumatic tools should be kept in a place by themselves. If suspended in benzine, not only will they be preserved but cleaned as well.

To provide proper tool drawers for the men is to put dollars into your own pockets. In the case of files, incalculable loss results from having them put, or perhaps slung with other tools into the same compartment.

Training the Men.—On this continent, where we have a vast army of men who do not undertsand or comprehend the value of the machines and tools they operate (and they can hardly be expected to do otherwise, since they have never been trained to do so), it is necessary to properly instruct them and to allow them time to overhaul and clean their machines thoroughly at least

once a week. If a man can be made to take a pride in his machine, he will soon begin to take pride in himself, and then in his work. The "bullying" system—under which no one bothers with such "trifles"—is gradually being superseded by a far superior and scientific method of instructing men in the way they should work and care for their machines. If conducted on these, or similar lines, it would not be long before such an article as the foregoing would be unnecessary, because it would be common practice.

CARE AND SELECTION OF MACHINE TOOLS.

BY H. G. BECKER.

Shop Demonstrator, Lehigh Valley, Sayre, Pa.

SELECTING TOOLS.

It is essential that a good selection of tools be made. Sometimes this is left entirely in the hands of the purchasing department, or some other department that is not even indirectly interested in the output and maintenance of the tool after it has been put in operation. The purchasing department is often interested only in the price and delivery. This sometimes results in the buying of inferior tools that are anything but suitable for the work they are to perform, resulting in a decrease of the desired output. Such cases often create a feeling between the two departments that is not of the best, and in some instances it dispels an interest that would otherwise have been shown. Coöperation between the purchasing and the mechanical departments is quite essential in order that proper consideration may be given to every tool purchased. A wise selection of a tool for a given class of work is more difficult than appears on the surface.

In some shops the foreman receives specifications of a machine or machines, together with test sheets showing the work which can be done with it, and is asked for his recommendations as to the machine. Probably it has only been on the market a short time and it is likely that the test papers showing the results obtained, are given by the manufacturers themselves. If the foreman has seen this machine in operation and knows that the results obtained are what is required in his shop, he will not hesitate to recommend it. On the other hand if he has not seen or heard of it, other than seeing the advertisement and the manufacturer's letter, he will, in most cases ask time for consideration and that the company send him to some shop where the tool is in operation, to see the actual work that is being done, in order that he may make an intelligent recommendation. The prime consideration is to select a tool that will give the largest first-class output, at the lowest cost of maintenance. If the tool is something entirely new, it would need to be sent to the shop for a trial of sufficient duration to demonstrate the kind and amount of work it is able to produce.

Again, a foreman will sometimes send in his recommendations for a certain tool that he knows will produce the output that is required, and is the exact tool the shop needs; after a patient wait he is apprised of the fact that the tool he recommended was not just what was needed and an order had been placed for what was deemed the best machine for the purpose, letting the foreman make the best of the output. This brings up the question: "Who is in the best position to know what tool is required to get the results in the shop?"

CARE OF MACHINE TOOLS.

After the various tools are selected and properly placed, the next point to be considered is the care that should be given them.

Leveling.—First, it is quite important that the machines be properly leveled and checked up from time to time to insure that they remain so. This applies particularly to the planer; in leveling this machine it is quite important that the center of the bed be raised just a trifle so as to leave the extreme outer ends a little lower. If this is not carefully watched it may result in a chatter; such cases have been overcome by raising the center of the bed. If the machines are not leveled properly, it may be the cause of a spindle or shaft binding in the bearings, and the best possible lubrication will not keep them from heating. In some cases a piece of work has been spoiled by being leveled by the operator, he taking it for granted that the table or bed of the machine was level, and not trying it before setting up his work.

Lubrication.—After the machines are placed in service, the important point is that sufficient lubrication reach all bearings. These bearings must receive daily attention to see that the oil holes are thoroughly clean, so that the oil can properly reach them. If any cutting is discovered on any of the moving parts, a report should be made at once. Frequently in the case of a cut bearing the operator will make the assertion that he oiled it every day. No doubt he filled the oil hole, but never looked further to see that the lubrication reached the bearing. Some plants have been forced to employ unskilled labor, due to the fact that experienced men are not in the market. This results in men of little or no experience being broken in on the various machines. Some of them may never have seen the inside of a machine shop, and such men, as a rule, do not appreciate the harm that may come from the lack of oil on the bearings. Unless the foreman constantly reminds them of this fact expensive bearings may be destroyed in less than an hour, putting the machine out of service for a day or possibly a week.

The kind of lubrication depends on the kind of bearing that is used and other conditions. For general use some advocate a heavy oil, while others prefer a thin one. The latter may be used with satisfaction, providing it is fed continually. A good grade of oil, having a good body, gives the best results for all-around use, and the very best grade is none too good.

Clean Machines.—Keeping the machines clean is next in order, and this cannot be too thoroughly impressed on the operator. We all know that the oil around the bearings seems to act as a dust magnet, catching flying particles. Unless the machines are cleaned quite often, the amount of dust and dirt that accumulates will soon work its way to the bearings, shortening their life. The smaller machines may be cleaned each day, taking but a short time, while the larger tools may receive a thorough cleaning each week.

BELTING.

In many shops it is the custom to leave the care of belts in the hands of one man, who looks after their maintenance in general; if he is a first-class man, he is as essential to the shop as its best mechanics. He keeps a close watch on all the belts and sees that the countershafts and machines are in line, thus keeping the belts from climbing and otherwise damaging themselves.

A good system, as established in some of the large plants, consists of a belt room provided with a bench, tension scales and other tools necessary for repairing and maintaining the belts. A record is kept of each belt, showing the location, when applied, type, kind of leather, thickness, width and length, etc., and also the dates of their inspection. A belt foreman is put in charge and he, with the additional help that is needed, inspects the belts and attends to all repairs, keeping an accurate record of them. A report is made each month showing the number of repairs, new belts applied, delays caused by belt breakdowns, etc., from which a close check can be made and it may be compared with previous periods, to determine the relative efficiency.

All old belts are taken to the belt room, and if damaged on the edges, are cut down and used for narrower belts; short pieces are scarfed and glued together. In case of an oily belt, the oil is taken out.

An annunciator is placed in the belt room, connected with a series of push buttons placed at different points in the shop, so that in case an accident occurs a foreman pushes the nearest push button, which indicates in the belt room the exact location of the accident. This proves to be a great time saver and insures prompt action.

SELECTION AND MAINTENANCE OF TOOLS.

BY C. C. LEECH.
Foreman, Pennsylvania Railroad, Buffalo, N. Y.

The consideration of this subject naturally divides itself under two general divisions, that of the equipment for an entirely new shop and that of renewing or adding to the equipment of an old shop, the latter possibly already crowded with antiquated machinery. In the case of the new shop we assume, of course, that whoever has charge of the purchase of the machines, be he shop superintendent or foreman, is first of all thoroughly familiar with the class of work that is to be turned out. Knowing this, it is comparatively easy to select the most suitable machines to produce the desired results, providing one is not hampered by having to narrow the equipment so as not to exceed certain appropriations, and also if the output of the shop is to be something that has already been manufactured. We have then the experience and the mistakes of others to profit by. It is always well to go about extensively and see what others are doing and how certain machines do their work. One can tell much more about the merits of certain tools in this way than by the photographs in the catalogue of the builder or in listening to the sales-agent holding forth on their worth, though his words fall in golden cadences. If we are given free hand our selection will be governed by the principles of suitability and durability, coupled with get-there-ativeness and goods producing qualities, when properly handled and each machine is worked to its capacity.

Location of Machine Tools.—The problem of proper location or grouping of the machines in the new shop is not specially difficult. Judgment should be used in order to so arrange each machine or group of machines that the work or the articles manufactured are constantly progressing toward the storehouse or shipping department. Retrograde movements, made necessary by badly arranged grouping of machines, cause confusion, loss of time and added expense. Where possible, space should be allowed for expansion and additional machinery. Room must always be allowed for proper and expeditious handling of the work. If it is necessary to add more tools of the kind already in use it may be better to duplicate in some instances, whereas, in other cases, newer, heavier and more improved tools are best. This is a matter of conditions and of judgment. If the tools are all motor driven it will greatly facilitate the grouping. In an old shop, probably pretty well filled up with old machinery and very likely poorly arranged, a nice problem is presented where one is called on to replace and rearrange them without serious delay to the work, especially if it is a busy season. Here again the exercise of careful judgment is needed and is where experience tells. I had a problem of this character to deal with a few years ago when my company added to and replaced some thirty machine tools, in a comparatively short time, in a shop with a floor space about seventy-five feet square. All of these machines were much larger and heavier than those taken out. All were belt driven, so that the placing had to be governed somewhat by the overhead room for countershafts and belting.

Maintenance of Machine Tools.—If a regular man can be assigned to run each machine or several machines of one kind it is, of course, the best way. He will take a greater interest in caring for the machine and keep up the tools and little labor-saving devices that he will naturally have. You can also hold the man directly responsible for the proper care and appearance of the machine. On the other hand, where there are many more tools than men to run them, the problem is more difficult. Human nature in the mechanic is much the same as in other people, and the natural feeling when he is placed on a machine temporarily to do a certain piece of work is to get through it to the best advantage and without much thought in the way of leaving the machine in good shape for the next fellow. I say this is the natural feeling, but I have found where it is necessary to run a number of our machines in this way, by reason of having a small force of men, a system can be established whereby all are for one and one for all. Each man takes a personal interest in all the machines he is called upon to use and sees that the tools are in proper shape, not losing sight of the fact that he may have to return to the tool within a short time, and the better condition it is in the better for him, especially under the piece-work system.

Keeping Machine Tools Clean.—Nothing is more attractive to the eye than nice, bright, clean tools. Under some climatic conditions tools are not much affected with rust, and keeping them bright and polished up is comparatively easy. On certain classes of machinery, slow running on heavy work, the operator has abundant time to do this, and will do so if notified that it is expected of him, of course not asking him to go into danger. On small machines where the operator is constantly using his hands on the work, there is no time for cleaning during working hours unless he stops the machine. Shop superintendents must decide just how far they want to go and how much time they are willing to give to it. Again the climatic conditions may be such that it is practically impossible to keep the machinery bright, and I have known it to rust in ten hours after being polished and well coated with oil. I do not refer here to ordinary cleaning and wiping with waste and oil, which of course all machines should receive, and usually do receive almost every day. This latter I require of each man who uses any one of the tools, and about twice a week we send a shop helper over all the tools that have no regular attendants.

Belting.—There are a few simple rules relating to the application, care and preservation of belting that it might be well to consider at this point. It pays to have the best belts. Nothing is more aggravating to the operator than a belt continually giving trouble from stretching more on one side than the other, or that will not run properly on the pulley, to say nothing of loss of time and expense. Part of such trouble may of course arise from the shafts and pulleys being out of line, and they must be watched. Belts should never be tighter than absolutely necessary and should not be overloaded. Use as wide a belt as the pulley will allow. The value of a good machine depends largely on belt performance, and good belting is a work producer because it keeps the machine running up to its maximum capacity. I had a pair of new 4-in. single leather belts that had to be laced ten times in seven days and stretched 24 in., and in the end had to be thrown away, as it was impossible to make them run right. Sometimes a belt that has stretched too much on one edge and will not run properly can be made to do all right by turning it completely over, and I have in addition reversed the belt end for end and had it laced pretty snug and had no further trouble with it. Users of belts are of course familiar or should be with the fact that the grain or hair side is the best to run next the pulley on account of its smoothness, and in order to subject the opposite or flesh side of the belt to the least wear. Also the belt should run with and not against the splicing. A little belt grease should be applied occasionally to keep the belt soft. The best plan is to have a regular man look after all the belts and keep them in good order, not waiting until the belt gives out on some important machine, causing an expensive and vexatious delay. The inspection of belts largely eliminates these troubles.

Care of Pneumatic Tools.—The care of pneumatic tools has grown in importance with their increased use. In our tool room department all air tools come under the supervision of an expert. Each tool is tested and lubricated upon its return from service. Plenty of air hose of various lengths with suitable connections to meet all conditions of the work should be kept on hand.

Tool Checks.—The check system governing the use of tools by the workman can be carried to a high degree of efficiency in the shop and engine house. Our custom is to allow each man, who has need for tools other than his own, five tool checks. These checks are deposited with the tool attendant, one for each tool taken out. When the tool is returned the men receive back the check. A tool room should be located in the engine house at

a convenient point, and should be large enough to take care of all the larger tools, such as sledges, bars, jacks and trucks. Many tool rooms are so small that only the smaller tools, such as wrenches, etc., can be kept there, and in consequence much valuable time is lost in hunting for the other tools, that are left in engine pits and out-of-the-way places. The machine shop tool room should be equipped with all necessary modern machines for maintaining the tools in good condition and there should be enough expert mechanics in the tool room department to carry this out. In addition, every tool should come under the inspection of the tool attendant every day, that all may be kept in repair. If the tool is lost or broken it is an easy matter to follow it up, as the man's check is against it. I believe this system in a modified form can be extended to repair yards and would be the means of a great saving in tool costs through loss and breakage.

SELECTION AND CARE OF RAILWAY SHOP MACHINERY.

BY M. H. WESTBROOK, BATTLE CREEK, MICH.

SELECTION OF EQUIPMENT.

In selecting the machinery necessary to equip a railway shop the first thing to be considered is the amount of each class of machine work to be turned out. This is necessary in order to decide what special machines to recommend. For instance a special frame planer or slotter would not be needed in a shop where but a few frames are handled in a year, but rather a machine which, while not handling a frame as economically, would be in constant service to its fullest capacity on other work the year round.

In purchasing machinery too much attention should not be paid to the claims and recommendations of the machine salesmen, who, while generally found to be good fellows, are inclined to try to sell machinery not adapted to meet the requirements at all. I have had salesmen try to convince me that a special slot milling machine should be installed to be used on piston and valve stem keyways in a shop that would only have use for such a machine about five hours a week.

Before deciding what to recommend a few days could be most profitably spent in some of the modern shops doing similar work, taking notes and observing the various new types of machines in operation. I would recommend the purchasing of all lathes, drill presses, planers, etc., from one maker as far as practicable. When the time comes for repair parts, they are more readily obtained. Also interchange of parts is more easily accomplished should there be more than one machine out of commission due to breakage. This idea should also be carried out in the matter of pneumatic tools. Decide on one good make and then get the motors and hammers from that manufacturer. I have in mind one shop that is carrying repair parts for no less than seven different makes of air tools, although they could easily be confined to two at the most with much better results.

As much attention should be paid to the smaller equipment as to the higher priced machines. Even in a shop equipped with overhead traveling cranes there are times when with but two men working, both require the services of the crane at the same time. The inconvenience and loss of time will be much greater where fifty or more men make use of it. Therefore as far as possible see that each large machine is equipped with some supplementary method of handling material on and off the machine. This is a matter that should not be overlooked or treated lightly if the greatest shop efficiency is to be looked for.

See that modern bench vises are procured and that the benches are not too high for them, a common fault. Have machine reamers and twist drills of high speed steel, with larger shanks than most companies supply. Do not overlook the many special devices now on the market to facilitate the work done in the brass department. This department in many railway shops is not nearly as up-to-date as the others. The new air chucks and countershafts now on the market have proven great time savers. Such briefly are some of the points to be looked after in the selection of machinery.

THE CARE OF MACHINERY.

By this is meant the system best adapted to keep each machine in profitable service the greatest length of time, reducing to a minimum its non-producing moments. My experience has been that lack of proper first aid has been the most fruitful cause of machinery breakdowns. In caring for machinery first see that every frictional surface has proper means of getting lubrication to it and that the operator is thoroughly posted as to where each oil hole is and what it is for. This should be a personal matter with the foreman and the operator. Very often it is necessary to put in larger oil tubes in newly purchased machinery.

Attention must also be given to the oil used, especially in winter, as certain grades of oil thicken so in cold weather that they will not reach the desired spot. The operators should be trained to look after these essentials. For all overhead oiling I would recommend the services of a special man whose duty it would be to attend to every countershaft and journal box.

At the first slight breakage or threatened breakdown stop at once, if at all possible, and make the necessary repairs. It may be a broken gear tooth, and I have seen them running for months, with no attention given them, until the whole gear and possibly several others were stripped in an instant, where if but one tooth had been inserted at first no more trouble would have occurred. As soon as a journal is found worn, take it out and see that the bearings are properly repaired. This would possibly take a few hours, saving eventually a prolonged period of idleness for the machine.

SELECTION AND CARE OF MACHINE TOOLS.

BY GEORGE BLACK.

Machine Shop Demonstrator, Canadian Pacific, Angus Shops, Montreal, Can.

The selection and care of machine tools and equipment, involving as it does the expenditure of large sums of money and in a large measure determining the output of the shop, is a most important duty of the machine shop foreman. His selection must be justified by results. Immediately the need for the addition of any new machine is felt, either to cheapen the production or increase the output, the up-to-date machine shop foreman should have the machine for the job in mind. He will know that the heavy duty required of modern machine tools by the developments in high speed steel, calls for rigidity to stand up to the heavy feeds and speeds without "spring"; ample power to pull with the heavy duty required; and a wide range of feeds and speeds in order that all operations may be performed at the most economical rate. The best machine on the market is none too good.

With the machine selected, the next important item is to locate it in the best position, so that its work, as far as possible, comes to it as a natural sequence in its progress through the shop towards the finished product and thus unnecessary handling is avoided. This is necessary and greatly to be desired, more especially if the work is heavy and requires a large crane to handle it; in that event we have to face a great amount of lost time and machine hours, through inefficient crane service, which will amount, even in a smart shop, to as much as 8 to 10 per cent.

Time spent in securing a firm and unyielding foundation is well repaid, for without it, it is next to impossible to get the best work out of a machine. Having secured the foundation, see that the machine, no matter of what type, is level and kept level, for we are prolonging thereby its life and insuring the maximum output and efficiency as far as the machine setting is concerned.

Machine hours, i. e., hours the machine is running, is what counts in a machine shop, and every nerve should be strained to keep the machine in operation, and on the work it is specially

adapted to handle. Carelessness cannot be tolerated in handling machines, and every case of breakdown, due to carelessness, should be severely punished. Operators should be encouraged to take a pride in their machines. A machine that is allowed to get choked with chips is not being treated fairly, and with the heavy duty required it will not be long before it gives trouble. "A stitch in time saves nine," they say, and surely it applies with increased force to machine upkeep. Therefore if we make sure of the foundation, the setting of the machine, getting careful operators and encouraging them to keep the machines clean and well lubricated, we are taking all the precautions possible to avoid shut downs. For the rest, we must make sure of a good repair gang boss—a live man, who can be trusted to keep track of minor repairs, which neglected, often result in a much longer and more extensive repair being necessary.

MAINTENANCE OF TOOLS.

BY A. H. KEAN.

General Foreman, Chicago, Burlington & Quincy, Havelock, Neb.

The greatest destruction of shop tools arises from insufficient and improper oiling. Machine tools should last for an indefinite period, and will, if good care is taken of them. The greatest wear on all machines is in the gearing, and in most railway shops the gears are given but little attention. This is a big mistake, as the oiling and cleaning of these parts is essential in order to gain the highest efficiency. I have noticed machines cleaned and polished on all finished parts, but the gears were neglected, allowing dust and fine cuttings to settle in them, causing them to cut and wear. In the case of pneumatic tools the proper oiling is very essential. A good practice is to have a small vat to place the air hammers in, which keeps them from rusting, and they are always oiled and ready for use. All air motors and hammers should be returned to the tool room once a day for oiling. This will save considerable expense in repairs, and keeps the tools in commission a greater proportion of the time.

I am a believer in the tool check system. Each article should be checked out and a value placed on it. This makes it an object for workmen to take better care of the tools and to promptly return them. With the present economic conditions the greatest caution should be used in the selection of shop tools lest you get something that will not give the best results or be a revenue producer. Having decided on the tool that will prove advantageous, try to get it as soon as possible, so as to keep in the race in these days *of get there.*

THE CARE AND SELECTION OF MACHINE TOOLS AND SHOP EQUIPMENT.

BY GEORGE H. ROBERTS.

Assistant Machine Foreman, New York, New Haven & Hartford, Readville, Mass.

The quality and condition of the tools in a shop are the securities of its output. If a cheap lot of machines are installed, great losses are incurred through cost of making repairs and the time lost in making them. The best is always the cheapest. Good, substantial machines and tools are indispensable. A few years ago the cry was for "better steel," but such results were obtained that it was soon changed to "better and stronger machines" to permit the use of the new steel to its full capacity. Some surprising results have been accomplished through this competition. For instance the wheel lathes of ten or twelve years ago are mere skeletons compared to the massive ones of today. The power required to drive two today would have run the whole shop twenty years ago. The heavy and improved machines of today represent considerably more money than formerly, and more vigilance must be exercised in caring for them, both as to condition and operation, to get returns on the additional investment.

Equipment Inspector.—In a large shop there should be an equipment inspector to examine machines, belting and all apparatus daily, reporting to either the machine or the general foreman. By this method the condition of the shop equipment is at all times known and is in the hands of the "head" of the shop. In large shops the machine foremen or tool room foremen have not the time to make examinations of the equipment and to oversee their work also. If no special watch is kept over these matters they become neglected; very valuable machines have been allowed to become racked to pieces in a year or two. The old saying, "A stitch in time saves nine," holds true with machines as well as with a pair of trousers.

The Use of T Bolts in Slots.—Bolts should never be used in slots in the tables of planers, slotters, boring mills, etc., as the heads very seldom fit the slot, and if they do the strain is usually on one point and soon breaks out the slots. T shaped blocks should be provided for every machine, tapped out for a stud; these blocks should be from 3 to 4 in. long.

Bearings.—The bearings of machines should be washed out with kerosene occasionally to avoid their becoming clogged or gummed, causing them to run hot and cut.

Pits Under Large Machines.—Large planers and boring mills should have pits large enough to allow a man to go under them for inspection or repairs.

Check on Small Tools.—In all shops the small tool question is an important one, as they are easily lost or stolen, and if no check is kept on them no one knows how they come to be "missing." No tool should be allowed to leave the tool room without a check for it.

Exchanging Cutting Tools.—In the older and smaller shops the mechanics were permitted to go direct to the tool maker to have tools made or redressed, while today in the large modern shops the conditions demand that a system be established by which they shall receive the tools through the tool room by either going direct to it or by the delivery system. If every Tom, Dick or Harry is allowed to go to the tool maker, his time is used up listening to their wants instead of making tools. A reasonable number of each shape of tools should be kept on hand on racks in the tool room, ready for immediate exchange for tools requiring redressing. A mechanic should not have to wait a minute for a tool. Each tool should have its "shape number" and the kind of steel stamped on it.

Some results may be obtained by "rushing," but to get a lasting effect a schedule must be established as for a fast train. The "plodder" usually beats out the "rusher."

Care of Drills, Taps and Reamers.—All tools, such as drills, taps, reamers, etc., should be returned to the tool room as soon as they have served their purpose, and on reaching the tool room should be examined and put in serviceable condition. If they have been damaged the foreman of the department should be made acquainted with the fact, ascertain the cause and, if necessary, use discipline.

Don't Use Twist Drills for Cored Holes.—The drill question is an important one. High priced twist drills should not be used in cored holes. Flat drills can be bought or are easily made. I had a set of high speed flat drills made for roughing out holes in pistons for piston rods, and they are far ahead of either the boring bar or twist drills. The holes are drilled with the flat drill on a boring mill and are then reamed to size.

Twist Drill Tangs Broken by Worn Sockets.—A source of much trouble with twist drills is the tang. The drills and sockets or sleeves become worn and allow the drills to shoulder on the tang instead of fitting on the taper of the shank. This puts the whole strain on the tang and consequently twists it off. There should be a set of master drill shanks and sleeves in the tool room. An inspection should be made of all drills and sleeves as they are received, and the worn ones should be refitted or replaced. The trouble is not with the new drills and sleeves, but the worn sleeves spoil the new drills, and the worn tangs the new sleeves.

Belting.—Nothing but the best grade of belting should be used, as poor and inferior grades constantly cause trouble. All belts

should be examined daily, and as far as possible repairs should be made outside of working hours, for by stopping machines during that time the machine and operator are both idle. All heavy belting, such as motor belts and those for large planers, and boring mills should be cemented instead of laced.

In buying machines the shop requirements should be considered from every viewpoint, for when a mistake is made in selecting them it takes years to make it right.

A modern railway shop should have included in its equipment a gap lathe, triple head slotter, small and large boring mills. Centering machines and bolt cutters should be distributed throughout the shop; also taper bolt turning machines instead of turning them on centers, and Prentice lathes for small work, such as motion work, pins, etc. It should have a quartering machine equipped to true up crank pins to avoid "pulling" the pins and applying new ones for being 1/16 in. out.

A constant study of the shop conditions must be made in order to keep it on a good working basis; conditions change so that what was good three or five years ago will not do today.

FRICTION OF FREIGHT CAR TRUCKS ON CURVES.

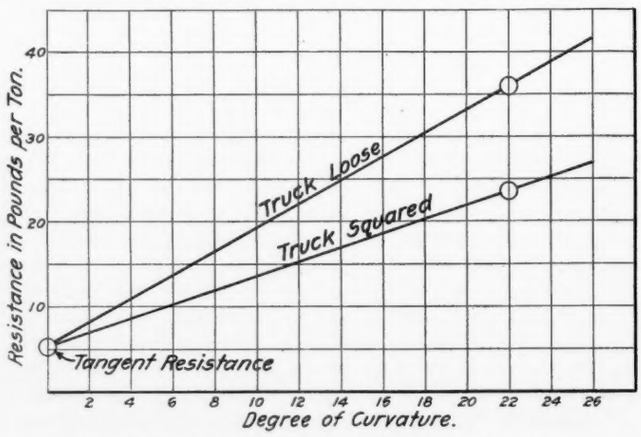
During the past few months extensive tests have been made to determine the relative resistance of squared rigid trucks, and those in which the side frames are free to move forward and backward, parallel to each other, thus allowing the wheels on one side to get ahead of those on the other side in going around a curve. A squared truck is one in which the side frames are held so that the wheels on one side do not get ahead of those on the other, and in this manner the truck is kept square.

After the adjournment of the American Railway Association at St. Louis, some of these tests were repeated on November 17, and a number of the members of the association were present to witness them. The tests were conducted on a special experimental track at the plant of the American Steel Foundries, Granite City, Ill., by Louis E. Endsley, associate professor of railway mechanical engineering, Purdue University.

The track consisted, first, of an incline having a drop of 36 ft.; second, a short tangent of 30 ft.; third, a 22-deg. curve of 298 ft.; fourth, a tangent of 257 ft., and, fifth, an incline having a vertical rise of 20 ft. The first incline was equipped with an electric hoist for pulling the trucks up the incline. By means of a figure four trip and a dead line, the truck could be released at any desired point. The track was equipped with electric contacts by means of which the velocity of the truck at any desired point along the track could be recorded upon an electric chronograph. In anticipation of the tests, the truck was placed upon the experimental track and pulled up the incline to the desired height and released a number of times until the distance it would run became constant. Five record runs were then made. From these five runs, the average velocity at the beginning and the end of the curve was obtained. From the velocity of the truck at the beginning of the curve, the total kinetic energy was obtained by adding to the energy of translation of the truck the energy of rotation of the wheels and axles. The kinetic energy was also obtained at the end of the curve by the same method. The difference in these two kinetic energies equals the number of foot-pounds absorbed by the truck in going around the curve. This loss in kinetic energy divided by the distance traversed by the truck is equal to the average resistance force upon the truck while going around the curve. This average force divided by the number of tons weight of the truck gives the resistance in pounds per ton.

The tests were conducted upon different types of freight car trucks and different modifications of the same type of truck. For this purpose, the trucks tested were taken from 50-ton cars in regular service, owned by fourteen different railways. Some twenty-five trucks in all, together with three specially constructed test trucks not included in the above, were used in the investigation.

The results obtained from the fifteen trucks tested, show that the average resistance, per ton weight of truck, upon a 22-deg. curve was 35.90 pounds for the loose truck and 23.63 pounds for the same truck squared, or a saving of 34.1 per cent. in favor of the square truck. These two average resistances for trucks loose and squared have been plotted, together with the resistance upon a tangent, which, for the fifteen trucks tested, amounted to 5.49 lbs. per ton, and a straight line has been drawn between the tangent resistance and the two curve resistances, thus giving two straight lines as shown, the upper one representing results from the loose truck, and the lower one representing results from the square truck. These lines were drawn straight, because it is generally accepted that the resistance on curves is in direct proportion to the degree of curvature. From these two lines, the results in the table have been computed, and the resistance for any degree of curvature up to 26 deg. is shown. Line No. 1 of this table gives the degree of curvature. Line No. 2 gives the resistance in pounds per ton for a loose truck, as obtained from the upper line in the diagram. Line No. 3 gives the results in pounds per ton for the square truck, as obtained from the lower line in Fig. 1. Line No. 4 gives the pounds per ton in favor of the square truck, this being the difference between Lines Nos. 2 and 3. Line No. 5 gives the per cent. in favor of the square truck.



Resistance of Freight Car Trucks on Curves.

TABLE SHOWING RESULTS OF TESTS OF RIGID AND LOOSE FREIGHT CAR TRUCKS.

1—Degree of curve	1	2	3	4	5	6	7	8	9	10	11	12	13
2—Resistance lbs. per ton, loose truck...	6.87	8.25	9.63	11.01	12.4	13.78	15.16	16.54	17.92	19.31	20.69	22.07	23.4
3—Resistance lbs. per ton, square truck..	6.31	7.13	7.46	8.78	9.61	10.43	11.26	12.08	12.91	13.73	14.55	15.38	16.2
4—Pounds in favor square truck.....	.56	1.12	1.67	2.23	2.79	3.35	3.90	4.46	5.01	5.58	6.14	6.69	7.25
5—Per cent. in favor square truck.....	8.1	14.5	17.4	20.2	22.5	24.3	25.8	26.9	27.9	28.9	29.7	30.3	30.9

1—Degree of curve	14	15	16	17	18	19	20	21	22	23	24	25	26
2—Resistance lbs. per ton, loose truck...	24.83	26.22	27.6	28.98	30.36	31.74	33.13	34.51	35.89	37.27	38.65	40.04	41.42
3—Resistance lbs. per ton, square truck..	17.03	17.85	18.68	19.50	20.33	21.15	21.98	22.8	23.62	24.45	25.27	26.1	26.92
4—Pounds in favor square truck.....	7.80	8.37	8.92	9.48	10.03	10.59	11.15	11.71	12.27	12.82	13.38	13.94	14.5
5—Per cent. in favor square truck.....	31.4	31.9	32.3	32.7	33.1	33.4	33.7	33.9	34.1	34.4	34.6	34.8	35.0

It will be seen from the results in the table that the per cent. of saving in resistance in pounds per ton in favor of the square truck varies from 8.1 on a 1 deg. curve to 35.0 on a 26 deg. curve, and, taking 4 deg. as the average main line curve, the saving is 20.2 per cent. in favor of the square truck.

Shop Kinks.

FROM THE LEHIGH VALLEY SHOPS AT SAYRE, PA.

BY F. E. LISTER.

The shops of the Lehigh Valley at Sayre, Pa., are by far the largest and most interesting of any of the plants yet visited by a staff representative in search of shop kinks. The kinks shown in this collection are especially interesting, because they are ones which are found necessary in a thoroughly up-to-date and fully equipped shop. It has been generally considered that the small, semi-well equipped shop would necessarily produce more and better shop kinks, but an inspection of the devices here shown seems to demonstrate the fact that kinks in any shop, whether it be large or small, are a necessity, and fill a want which is not met in any other way. A. M. McGill, superintendent of shops, has a well-oiled and easy-running organization. His diplomacy in dealing with his subordinates, from the general foreman down, and the fact that he is personally acquainted with every employee, has resulted in obtaining splendid coöperation. To him, and to J. C. Seeger, general foreman locomotive department; J. W. Hamm and Edward Seddon, machine foremen; H. G. Becker, shop demonstrator; J. W. Riley, blacksmith foreman; J. C. Pohl, general foreman car department; T. Lewis, general boiler foreman, and W. H. Dutton, foreman painter, we are especially indebted for assistance in obtaining the collection of shop kinks.

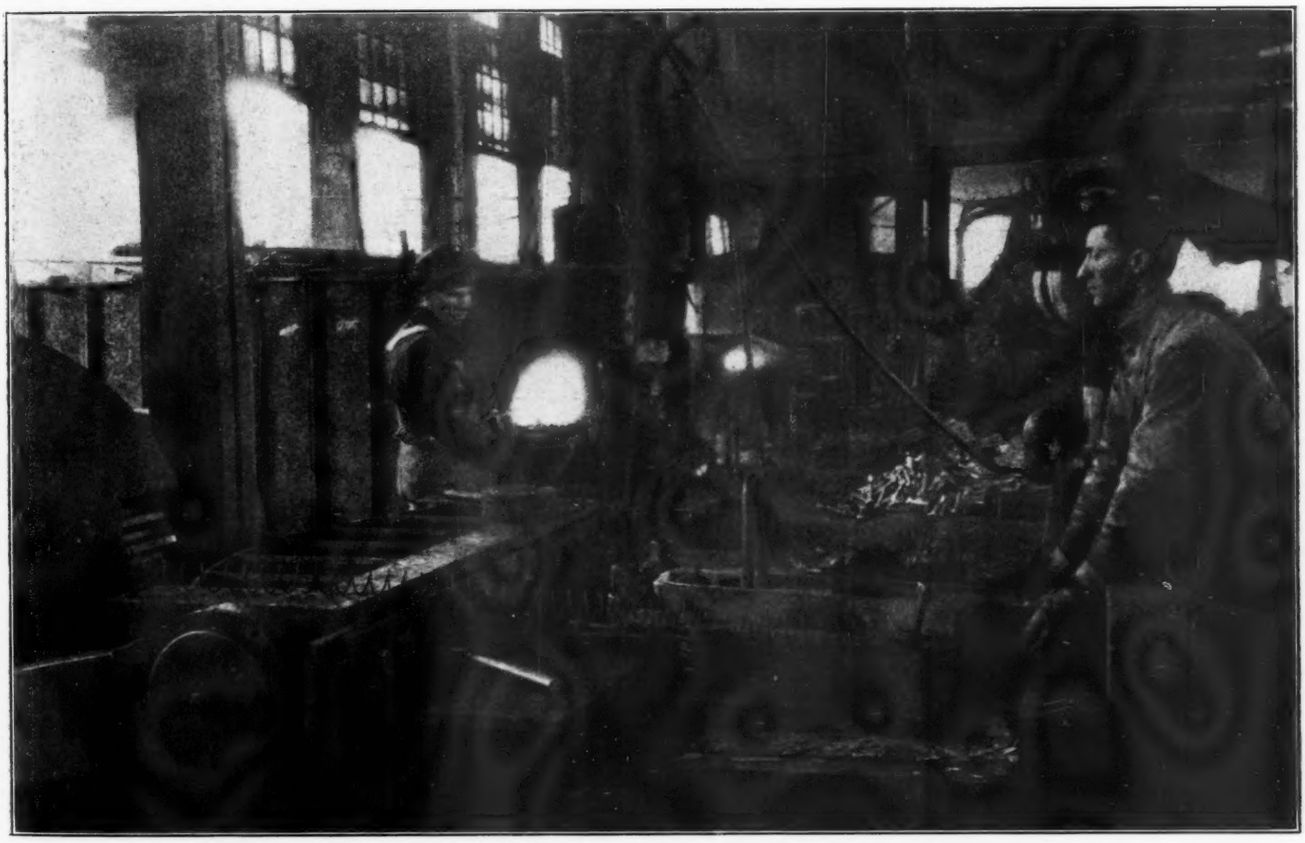


Fig. 1—Bending Drawbar Yokes and Rivetting on End Plates in Bulldozer.

SMITH SHOP KINKS.

BENDING TANDEM DRAWBAR YOKES.

In the foreground of the photograph, Fig. 1, is shown a No. 7 Blakeslee bulldozer in the blacksmith shop. It has been stopped half way back on the return stroke and the drawbar yoke, which has just been forged, is about to be removed. These yokes are made of 1-in. x 5-in. stock, and have a plate of the same material at the closed end, where it is held by a rivet. The iron is heated in an oil furnace, located just beyond the machine, at the right; the piping at the end of the furnace may be seen near the operator. Three men are required; two handle the yoke, while the third heats the rivets and operates the controller, the machine being motor driven. When the machine is at full back stroke, the two coil springs hold the wings parallel to the bulldozer head. The cold end plate, with the heated rivet, is placed in its position and the stock for the yoke is then placed in the machine. The rivet set, fastened to the crosshead, presses against a movable block with elongated holes, which makes a straight end on the finished yoke. The elongated holes in the block permit of its being pushed back so that the stock may be easily placed in the machine. As the machine advances, the two wings complete the bending of the yoke before the crosshead, carrying the rivet set, makes its full stroke and forms the rivet head. The finished yoke is removed from the machine by the lever, which is attached to a wall crane. The loop which holds the yoke has two feet at right angles, and as this loop is placed in position before the yoke is formed, the yoke extends over the feet when the bending is completed. The holes in the stock are cold-punched. The hole through which the end plate is riveted serves to gage the yoke stock for bending. On one run 175 yokes were made complete with riveted plates in 175 minutes.

BENDING BRAKE HANGERS.

A set of formers used on the Blakeslee bulldozer for bending brake hangers is shown in Fig. 2. The machine is shown at full back stroke. The two wings which bend the stock are

drawn full open as soon as the return stroke begins by the coil springs, which permits the formed hanger to be removed and stock for another to be placed before the wings are again carried forward. The machine, therefore, operates continuously and a hanger is formed at each revolution. The arrangement at the left is provided to center the stock. The angle-iron has two pins, over which the stock is placed, and the slot guides the tongs to the center of the stock. It is then carried to position in the formers, a slot in the center block guiding the tongs to bring the stock central. There is a movable block, which slides on two bolts—the heads of which are shown—through slotted holes. This arrangement permits of easily placing the stock and also for making the bends square, as the crosshead forces it tightly against the hanger at the end of the stroke. These hangers are made of 1-in. stock and 125 may be bent per hour.

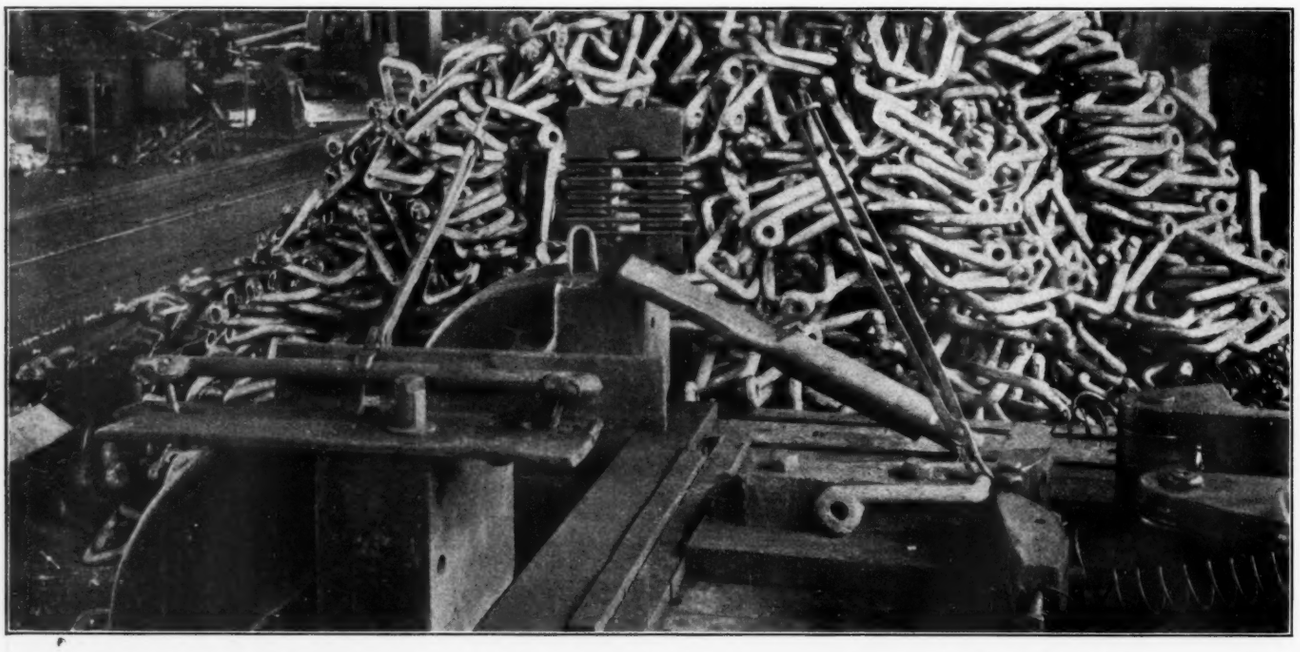


Fig. 2—Bending Brake Hangers on the Bulldozer; also Block and Plunger for Making Staples.

BENDING STAPLES.

Resting on the left hand stop of the bulldozer in Fig. 2 are shown a block and plunger used in bending ½-in. staples cold. The block, which stands in an upright position when being used, is provided with six grooves for holding the straight stock. These grooves are cut at an angle, so that the stock will not fall out. The plunger is deep enough to bend the six staples at one time. The stock is cut from ½-in. scrap rods, on a shear and at an angle to provide the points. This arrangement will bend 700 of these staples per hour.

UPSETTING AND PUNCHING BRAKE HANGER ENDS.

The ends of the hangers, illustrated in Fig. 2, are upset and punched on a machine using the dies shown at the left in the photograph, Fig. 3. The half die at the right of the pair shows a piece of stock in position for being upset. The stock is first bent cold in the bulldozer, three pieces at a time. The pieces are then placed in a furnace, the bottom of which is 5 in. below the opening, which allows the ends to hang downward. After the end is upset, the stock is moved to the position shown in the left half die, and the hole is punched. As both plungers operate simultaneously, one heat only is required for both upsetting and punching. It will be noticed that the dies have inlaid blocks at the points of wear. These blocks are made of high speed steel and when the dies were first made, the steel blocks were hardened before being placed. After upsetting about 3,000 ends, it was found that the steel blocks were full of surface cracks. They were taken out, annealed, surfaced and again placed in position without hardening. About 90,000 ends have passed through dies since the blocks were renewed and they show no bad effects from the work. The large boss on the right hand die and the knife on the left hand one were used for removing the film of metal that forms when the dies do not close. This provision is not, however, necessary.

CASTLE NUT DIES.

The dies shown at the right in the photograph, Fig. 3, are used for forming large castle nuts. The stock used is 2¼-in. round, and the completed nut is made in two operations and one heat. The plunger on top of one of the dies is used first, with the stock placed in the lower impressions, as shown. This upsets the metal and forms the castle nut. The stock is then moved to the upper impressions and the round stock is punched away from the nut, there being no waste of material.

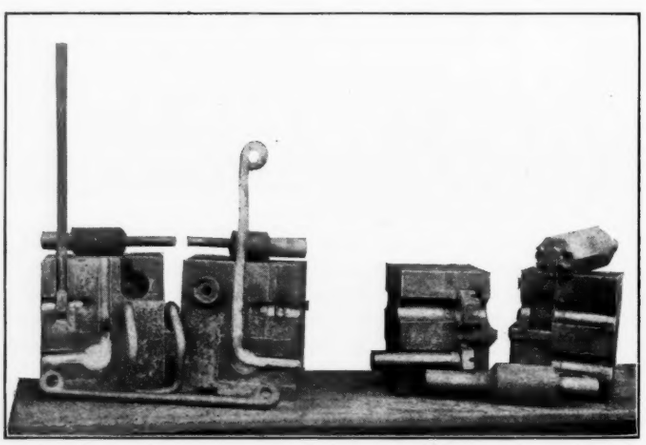


Fig. 3—Dies for Upsetting and Punching Brake Hanger Ends and Forging Castle Nuts.

BENDING MAIN ROD STRAPS.

A main rod strap, with the former that is used in bending it under a steam hammer is shown at the left of the photograph,

Fig. 4. A template for the stock is shown back of the former and to the right. The former is placed on the anvil of the hammer and the heated metal is placed across it, with the oil cup boss against the shoulder on the left side of the die. The block shown in front of the die is then placed on the stock and it is finally formed by a succession of hammer blows, it being necessary to use additional blocks as the strap forms.

COAL CAR HOPPER CARRIER IRON FORMER.

Dies for bending coal car hopper carrier irons, a finished one of which is shown resting on top of the formers, are shown at the

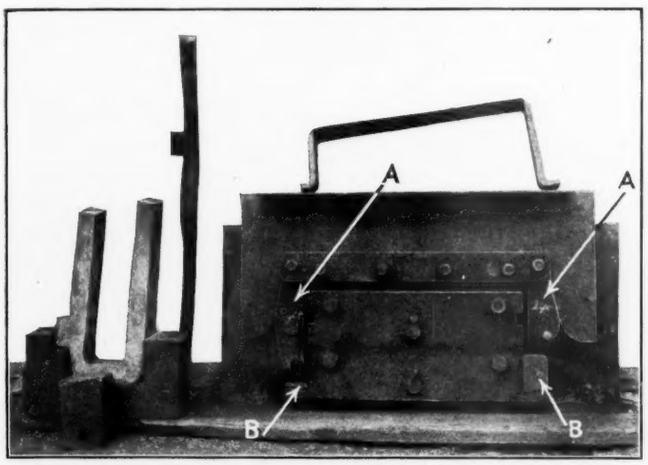


Fig. 4—Dies for Bending Main Rod Straps under a Steam Hammer and for Forging Coal Car Hopper Carrier Irons.

right in the photograph, Fig. 4. The upper former fastens to the crosshead of the bulldozer and the lower one to the bed of the machine. When it is at full back stroke, the swinging arms, A-A, are drawn back by coil springs parallel to the crosshead. That portion of the carrier iron which is horizontal lengthwise when it is in use, slants downward toward the outside and the part of the former which forms it is therefore, made accordingly, as close inspection will show. The two arms, A-A, have slotted holes which allow the bending of the lips without breaking the metal; when the machine reaches its full forward stroke, the arms are pushed forward to make square bends on the two lips. These carrier irons are made in rights and lefts, and the arms and small blocks, B-B, are exchanged when making a change from right to left. The blocks, B-B, are made loose, as they have to be removed after the carrier iron is formed, so that it may be gotten out of the machine, due to the slanted side.

SPRING HANGER GIB DIES.

The pair of dies at the extreme left in the photograph, Fig. 5, is used for making locomotive spring hanger gibs, one of which is shown. The stock is drawn out from scrap tires into strips 7/8-in. x 2 3/8-in. The heated metal is fed into the dies from the top and when the plunger enters, it forces the metal against the knife edges of the steel inlays, cutting off and carrying a portion on into the forms. This then becomes a closed die, and it is necessary to make provision for the air which would be confined. The small grooves machined from the center of the impressions answer this purpose. The gibs are afterward put in a rattler, thus removing the burrs.

WELDING BOTTOM BRAKE RODS.

The dies in the center of the photograph, Fig. 5, are used in welding the jaw ends of bottom brake rods. The completed rod is shown in front of the dies. The plunger has a central rib, which enters between the two forks of the jaw, so that pressure is exerted over the entire welding surface. The drawings used in making these dies were furnished to Mr. Riley by John Roach, master blacksmith of the Philadelphia & Reading.

PUNCHING DIES FOR BRAKE ROD ENDS.

The dies at the extreme right in the photograph, Fig. 5, are used on a power punch for punching the three pin holes in the jaws of brake rods, as shown. The upper die with the three punches, is carried by the movable head, while the lower die is fastened to the bed of the machine. This punching work is done after the welding, the end of the rod being inserted in the die as shown at the edge of the photograph. A wedge is then driven in alongside of the stock to force it against the guiding side of the die and thus insure the centering of the holes. This wedge is loosened after the holes are punched, thus relieving the metal and allowing it to be easily removed. The jaw is then turned over for punching the other side. It is necessary in this case to run a strip of thin metal in on the under side of the central portion of the die to prevent the second punching from dropping partly into the punched holes of the lower half of the jaw, thus preventing its removal. The dies were designed for

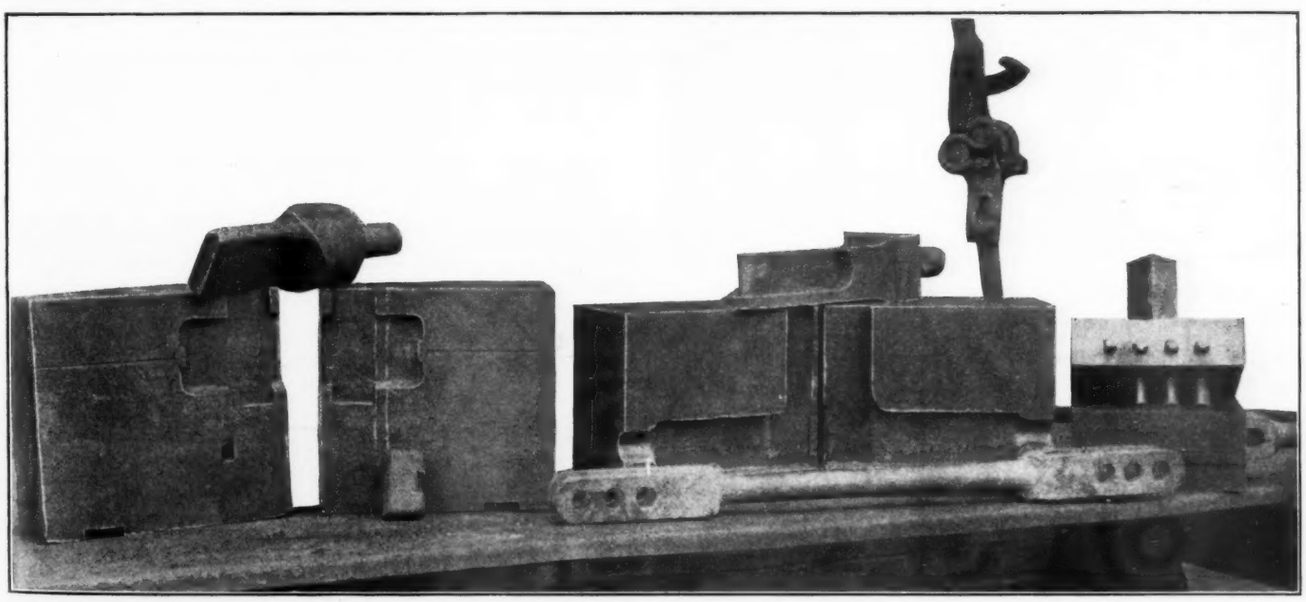


Fig. 5—Dies for Forming Spring Hanger Gibs, Welding Bottom Brake Rods, and Punching Them, and a Device for Bending S-Hooks.

punching four holes at a time, but this particular job requires only three holes.

BENDING S-HOOKS.

A device for bending S-hooks rapidly by hand is also shown in Fig. 5. The stock used is ½-in. in diameter and is heated in a small furnace near the anvil, to which the device is fastened.

MACHINE FORGINGS.

A board in the blacksmith shop on which samples of all machine forging work is kept is shown in Fig. 6. Several of the forgings and the dies for making them have been described above.

CAR DEPARTMENT KINKS.

ADJUSTABLE SCAFFOLD.

A coach shop scaffolding, with the widest possible range of adjustment, is shown in the illustration, Fig. 7. The flanges of the end casting act as guides and also provide metal bearing surfaces for the truss rod bolts. The pulley jaw is made separate, of wrought iron, and is secured by a nut on the under side

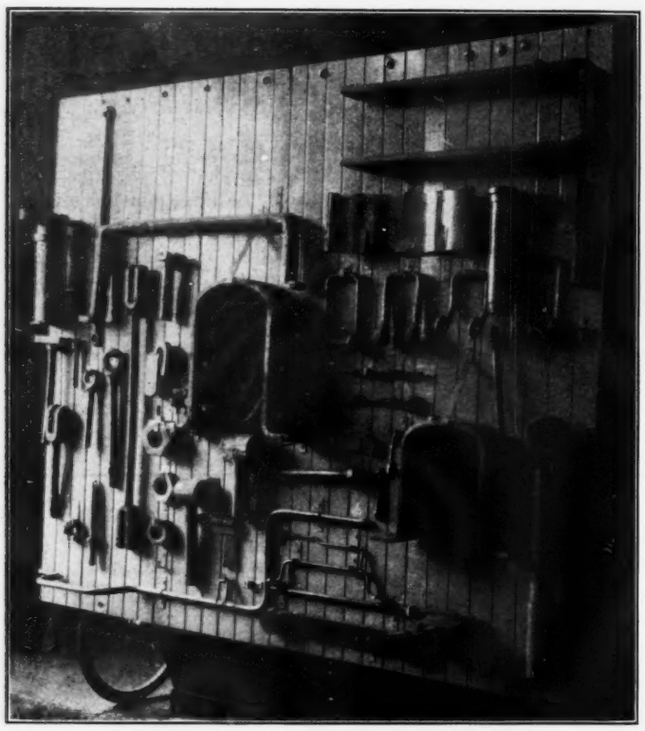


Fig. 6—Machine Forgings Made at the Sayre Shops.

of the scaffold. Pulley wheels, similar to those shown, are mounted near the tops of the posts. Special features of this scaffold are its quick adjustment; the safety afforded; the unusual distance, 11 ft. 4 in., over which adjustment is possible; and the provision for quickly raising the scaffold to the top of the posts and entirely out of the way when it is not being used. The short chains, about 3 ft. long, that are fastened to the posts near the bottom have hooks at the other ends which engage the chains that are used in raising and lowering the scaffold, thus locking the scaffold in any position to which it may have been adjusted.

PAINT SHOP BALCONY.

A general view of the paint shop balcony at the Sayre shops is shown in Fig. 8. The finishing, painting and varnishing of all sash, blinds, detached wooden seat ends, chairs, doors, window stops, window screens and deflector boards, etc., is done here. On one end of the balcony is handled the cleaning and bronzing of wire baskets, vestibule steps, seat striker arms, toilet boxes and other metal interior fixtures. At the left of the center of the photograph is shown an easel on which the miscellaneous sign writing, transom glass decoration, etc., is done. This balcony, being at one end of the coach shop and above the line of the coach tops, affords good light, heat, cleanliness and comparative

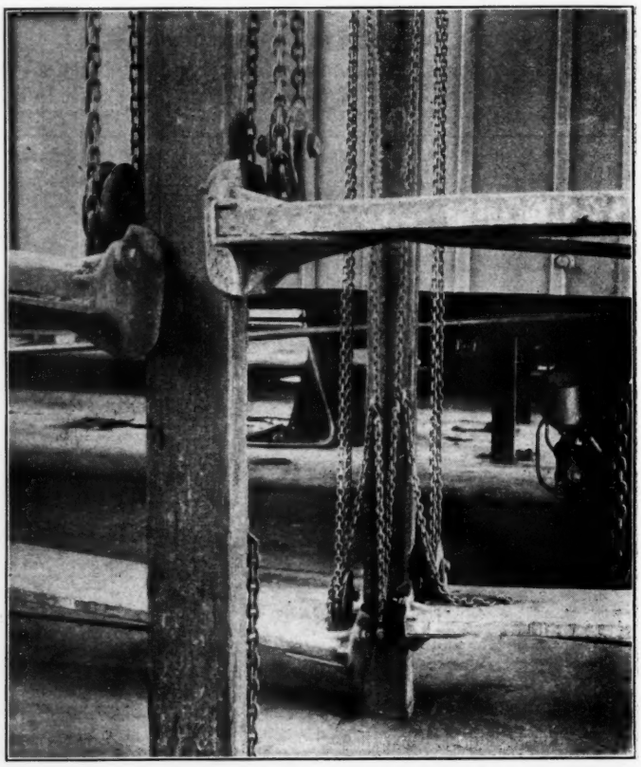


Fig. 7—Details of Adjustable Scaffold.

seclusion from the greater dust and dirt making operations of general coach overhauling.

At the right of the photograph is shown the office of the paint shop foreman, W. H. Dutton and inspector M. C. Hillick. Just beyond the office inclosure are shown three water coolers, mounted in position for painting and varnishing. A detail of these revolving stands is shown in the drawing, Fig. 9. The

Fig. 8—General View of the Paint Shop Balcony.

bases are made from castings formerly used in chair cars. The 12-in. diameter top is made to revolve, facilitating the pointing. These stands are also used for any miscellaneous painting when it is advantageous to revolve the work.

SASH RACK.

At one end of the paint shop balcony is located the sash rack shown in the photograph, Fig. 10. This rack will accommodate the sash from a dozen cars at one time, together with the deck and transom sash and the blinds. The adjustable partitions,

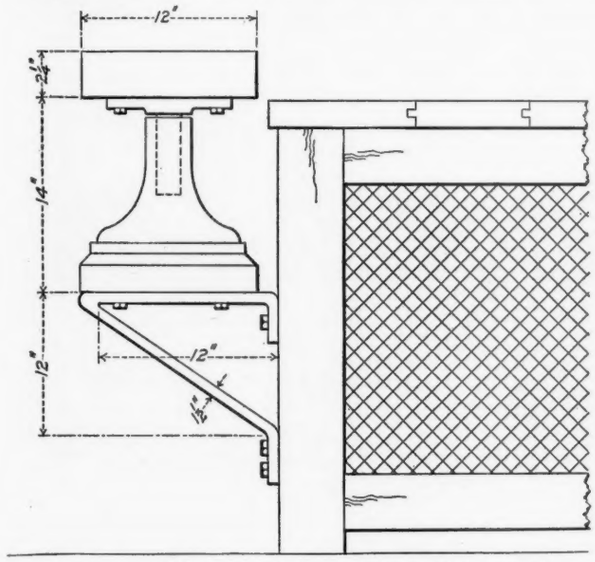


Fig. 9—Revolving Stand for Painting Water Coolers.

which carry cleats beveled to prevent marring the freshly applied paint or varnish, may be moved sidewise after loosening the winged holding clamps shown at the top. Similar clamps are provided at the bottom of the rack. Sash racks of this design afford a safe, clean and quick storage for sash and blinds, and allow the circulation of air for drying the fresh paint or varnish.

DOOR RACK.

At the far end of the paint shop balcony is a door rack, a near view of which is shown in Fig. 11. This rack affords a

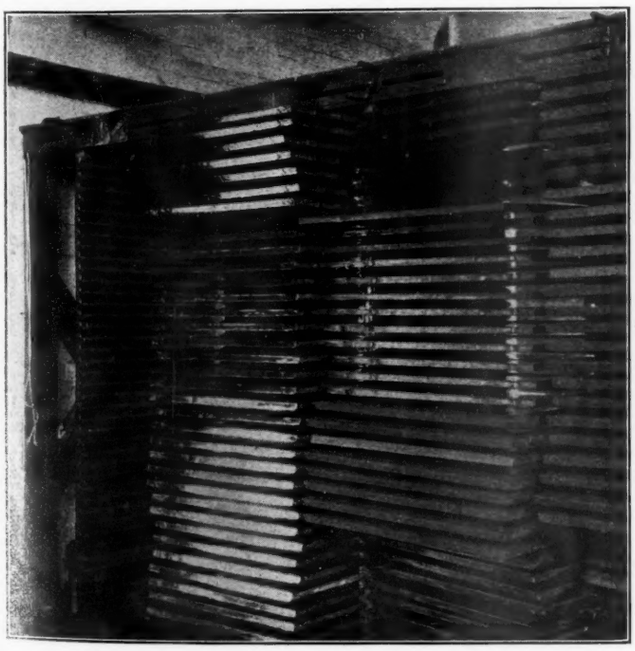


Fig. 10—Sash Rack with Adjustable Partitions.

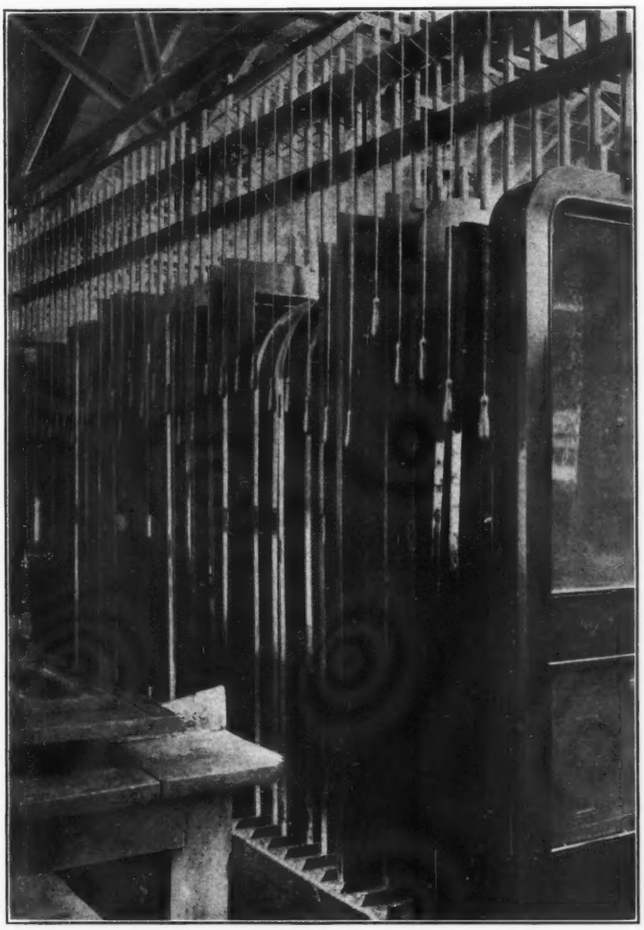


Fig. 11—Rack in the Paint Shop for Car Doors.

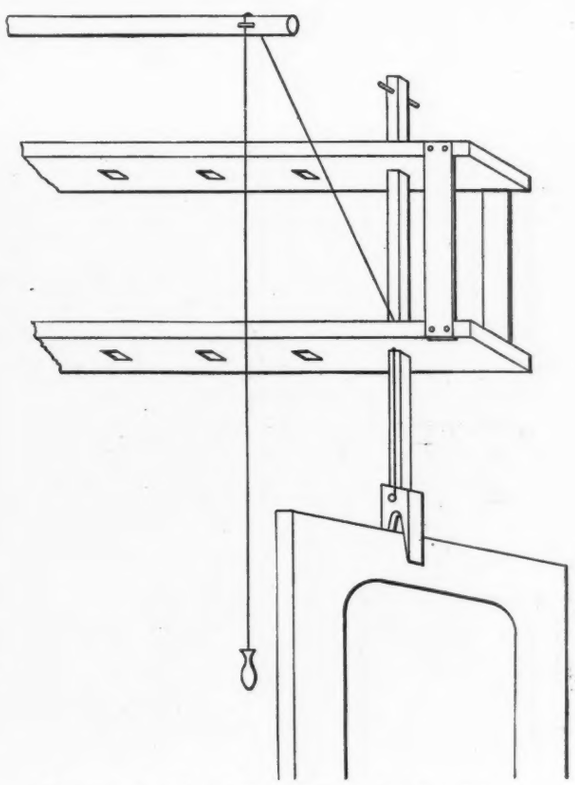


Fig. 12—Details of Top of Rack for Car Doors.

storage for 100 car doors, and utilizes a space which cannot be used to advantage for other purposes. The storage is compact, provides for the necessary air circulation and for a rapid and easy handling of the doors, as each is held independently. The drying of the doors is uniform and certain, assisted by the warm air from the heating system. The perspective drawing, Fig. 12,

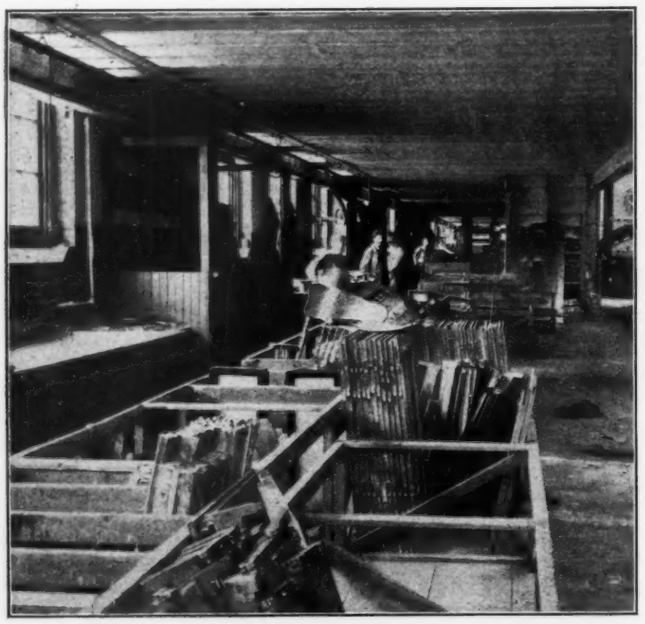


Fig. 13—Cleaning Department for Interior Coach Fixtures.

gives a better idea of the construction of the rack than does the photograph. The holding piece is raised to its full upward position when placing a door, and then falls to the position shown by its own weight. The jaw, being tapered, does not mar the freshly painted or varnished surface.

CLEANING INTERIOR COACH FITTINGS.

In one end of the coach shop and below the balcony illustrated in Fig. 8, all removable interior parts of passenger coaches

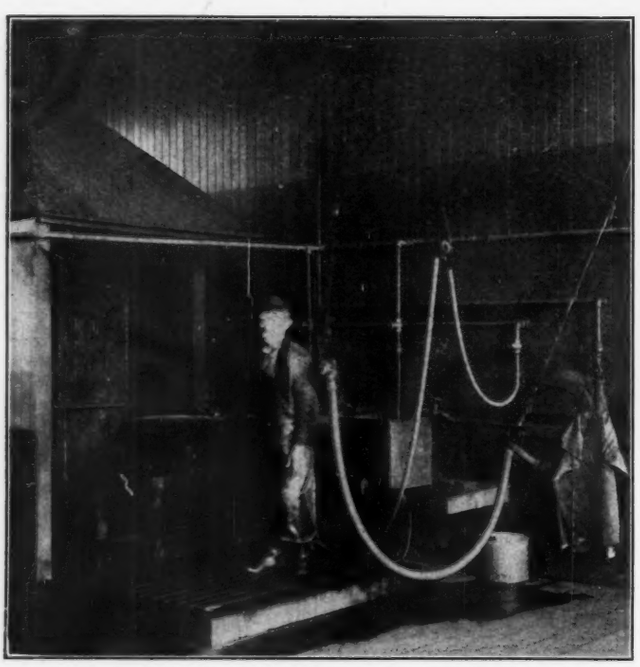


Fig. 14—Apparatus for Dyeing Plush Seats and Seat Backs.

are cleaned and repaired, preparatory to being taken to the balcony. A general view of this section of the shop is shown in Fig. 13. It is well lighted and heated. At the left one of the

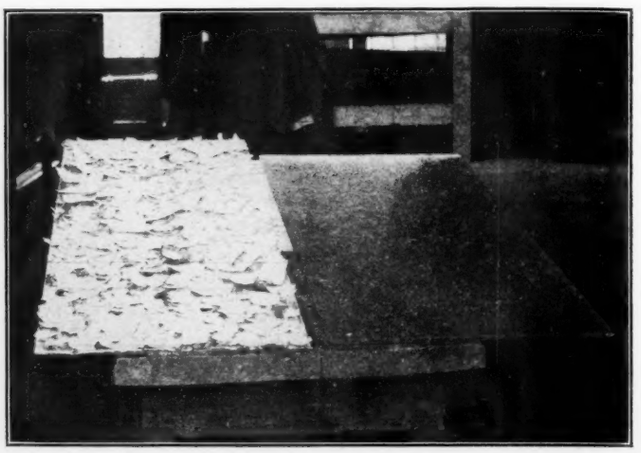


Fig. 15—Manufacturing Crackle Glass.

three copper lined tanks used for washing interior coach parts in lye water is shown. After washing, the parts are placed in the dripping racks located near the tanks. When dry the pieces are handled on the benches beyond, where all the necessary cabinet work is done, after which they are taken up stairs for finishing.

WASHING AND DYEING PLUSH SEATS.

In a portion of the upholstering shop building is a room in which seats and seat-backs are washed and dyed. This room is between the main upholstering shop and the storage room, so that after the cushions are inspected, repaired and cleaned, they are dyed and then sent to storage to await the completion of the car from which they were taken. The photograph, Fig. 14, shows the provision which is made for the dyeing process. Cushions are first dyed on the edges and then the tops, being handled on

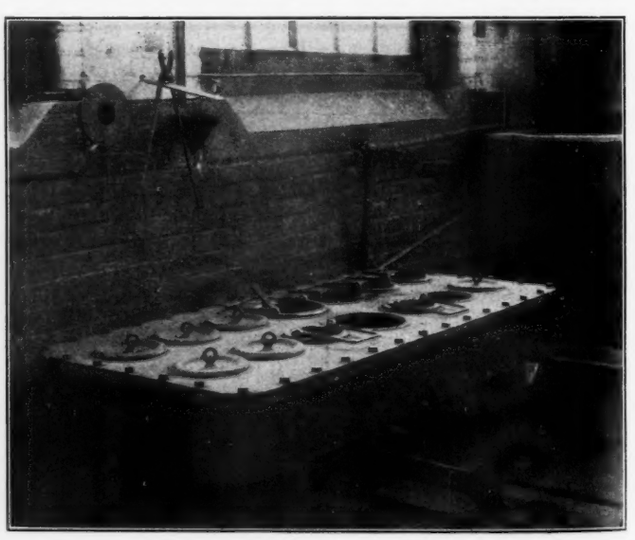


Fig. 16—Glue Pot in Cabinet Shop.

the revolving skeleton rest. The dye is put on with a stiff brush, which is dipped into the copper dye tank at the right. After being dyed, the cushion is placed with one end on the floor and the other against the framework, and is flushed with water. After flushing, it is returned to the position shown and thoroughly blown down with a 4-in. flat jet of air at 90 lbs. pressure. As the entire process requires but about four minutes, the water

used in flushing does not have time to soak into the cushion. The opposite side of the small structure is used for washing leather cushions and backs.

MANUFACTURE OF CRACKLE GLASS.

Two sheets of coach glass for use in state room or toilet room panels, or any place where a non-transparent light is used, are shown in Fig. 15. The glass at the right shows the completed work, while that at the left is in the course of preparation. The

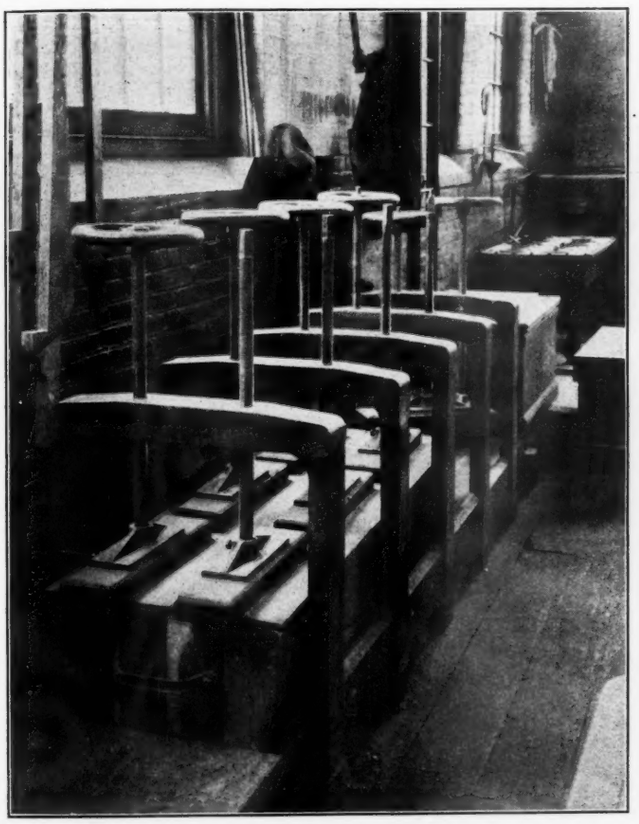


Fig. 17—Clamping Press with Glue Pot in the Background.

sheet of glass is first thoroughly sanded by a sand blast. This gives it a rough surface. It is then coated with a layer of specially prepared "Noodle" glue, about 3/32-in. thick, after which it is placed in an even temperature room, about 75 deg. to 80 deg., and left there until the glue dries. In drying, the glue surface cracks and the small pieces curl up as shown on the sheet of glass at the left in the illustration. As the surface of the glass was roughened by the sand blast, the glue adheres to it and in drying thin scales of the glass are carried off by the glue. There is, of course, no fixed figure, but very fantastic shapes and designs form. To make what is called a much finer crackle, a piece of glass may be put through the process a second time.

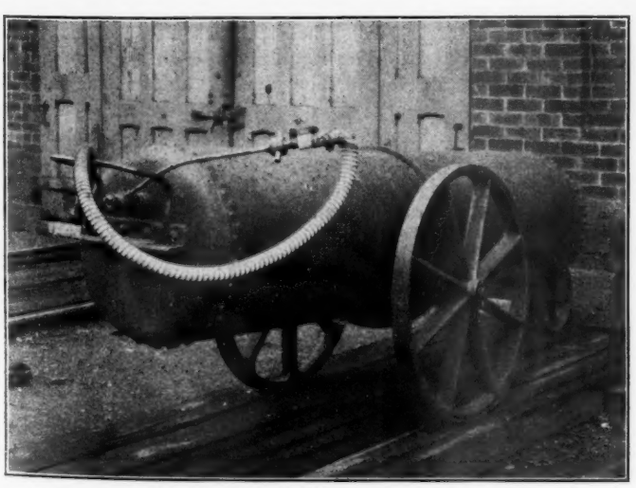


Fig. 18—Portable Gas Tank.

GLUE POT.

A cast iron glue pot in the cabinet shop is shown in Fig. 16. It is 62 in. long, 29½ in. wide and 7 in. deep, and rests on cast iron feet 20 in. high. There are 12 one-gal. and 2 two-gal. kettles, giving a total capacity of about 16 gals. The iron kettles have flanges on their top edges by which they are held suspended in the water. A coil of ⅝-in. copper pipe is placed upon the bottom of the pot and the steam and water regulating valves, etc., are located at one end. The pot is cast in one piece, with a flange to which the ribbed cast iron top is bolted.

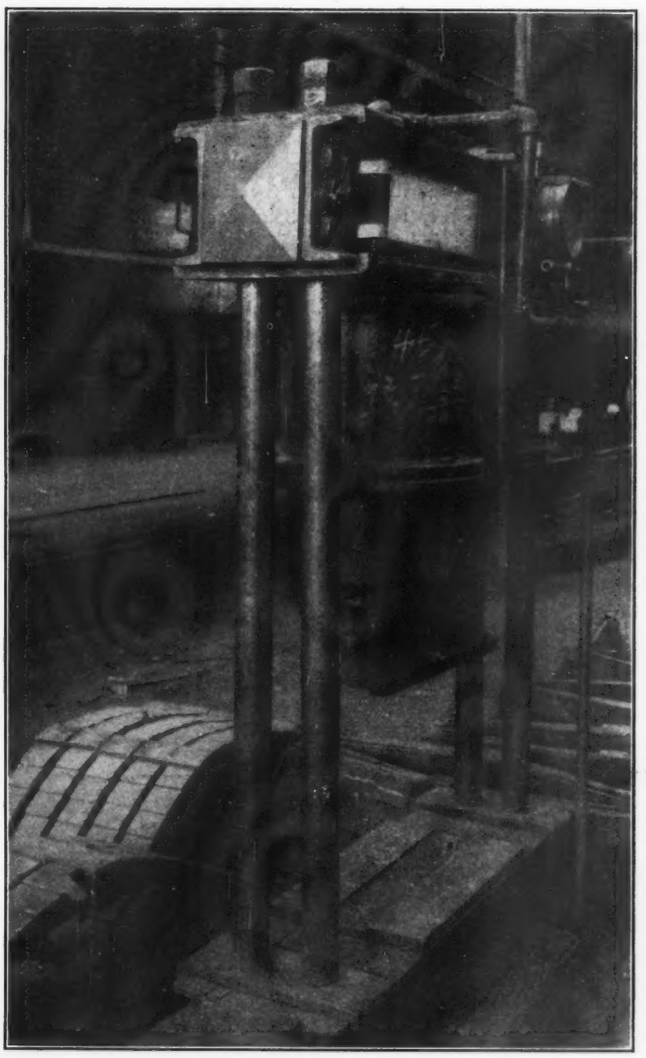


Fig. 19—Device for Testing Coach Springs.

CLAMPING PRESS.

Near the glue pot described above is a clamping press, shown in Fig. 17, with the glue pot in the background. This is used when gluing together several sections of light material to be bent to circular form. A form for ceiling boards is shown in the press. The frame pieces are made of wrought iron, 4 in. wide. The threaded bolts carry cast iron heads, to which wooden shoes are fastened. The hand wheels slip over the square portion

of the shaft, and may be shifted from one side of the press to the other.

PORTABLE GAS TANK.

A portable gas tank, used when testing the Pintsch lighting systems in passenger coaches, is shown in Fig. 18. It is an ordinary coach gas tank, mounted on cast iron wheels so that it may easily be transported about the shop. It is also used for taking gas from a coach just shopped, for use in another which is ready to leave the shop. In this instance, however, it is only possible to draw gas from the car tank until the pressures in it and the portable one are equalized.

TESTING COACH SPRINGS.

When overhauling coach trucks, springs of greater strength than those removed are used. These need not necessarily be new ones, but they must show a loaded weight at the same height, greater than the ones removed. The spring testing machine shown in Fig. 19 is used in this connection. Previous to removing the trucks from the coach, the springs are calipered between bands. Each spring is then put in the machine and compressed until its calipered distance between bands corresponds to that which was noted when it was under the car. The gage registers the pressure necessary to get this height. A new spring, or an old one from a larger capacity car, is then put in the tester and compressed until the gage shows the same pressure as did the spring removed from the coach. If the required pressure is attained at a caliper distance between bands greater than the removed spring, the second one may be used, but if this distance be the same or less than the first one, it cannot be used. The diagram shown fastened to the top cross piece of the tester shows some standard pressures, heights and carrying capacities of springs, as: at 100 lbs. pressure, a certain spring calipers 7⅝ in. between bands and will have a carrying capacity of 21,500 lbs. Another spring at 65 lbs., 8⅝ in. in height will have a capacity of 14,500 lbs. The two sets of uprights, set 34 in. apart, are made of 2-in. pipe. The top crosstie consists of two 8-in. channel sections, with a 10 in. x 10 in. wood filler block. The two cylinders are 10 in. x 12 in., both pistons being tandem connected to the wrought iron crosshead.

Fig. 20—Device Used for Drilling Journal Box Bolt Holes.

DRILLING JOURNAL BOXES.

The caboose section of the freight car shop is shown in Fig. 20. In rebuilding old freight cars to a capacity greater than that for which they were originally designed, it is necessary to strengthen the trucks, using heavier arch bar material, and heavier arch bar bolts. The rigging shown in the photograph is used in connection with drilling the bolt holes in the journal boxes larger. The journal box is held in position by a block wedged against one foot of the upright. A guide, or template, is used in drilling, to prevent the drill from running to one side in the hole as it would be very apt to do otherwise, since the work is that of reaming rather than of drilling. Flat-twisted, high speed drills are used.

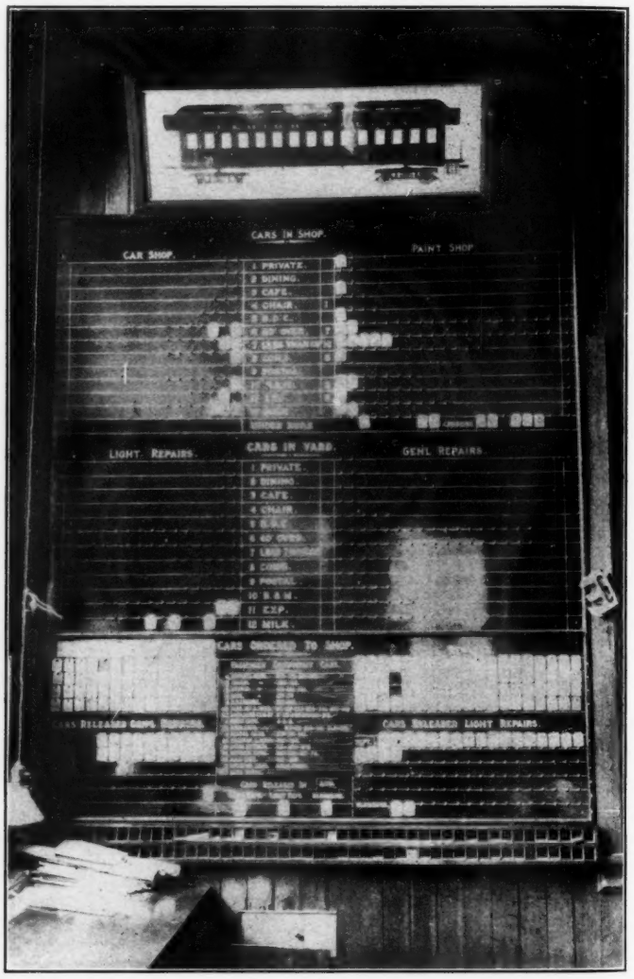


Fig. 21—Passenger Car Repair Board.

Hooked over one of the cross-ties of the built-up building column is shown an all-metal scaffold bracket used in the freight car shop. The extension arm is shown partly thrown up, to illustrate the fact that it may be moved up and out of the way to prevent its being struck by a passing car when not in use.

PASSENGER CAR BOARD.

In the office of J. C. Pohl, general foreman of car repairs, is an interesting passenger car board, as shown in the photograph, Fig. 21. The foremen are able to see at a glance just what cars are in the shop and to make provision for shifting them from

one shop and receiving them in another. The top section of the board shows that two coaches over 60-ft., two less than 60-ft., one combination, one baggage and mail, one express and three milk cars are in the shop. The right side of the top section shows the cars in the paint shop. The central section is for cars in the yard and indicates whether they are for light or general repairs, while the lower section is used for cars ordered to the shop. The car numbers on this lower section are sent in from the master car builder's office at Souh Bethlehem. It gives the different foremen a line on the work in sight and just what class it is. The cards bearing the car numbers are kept in the pigeon holes below the board.

ROOFING ROLLS AND CUTTER.

Pneumatically operated rolls and a cutter used in shaping and cutting freight car roofing material are shown in Fig. 22.

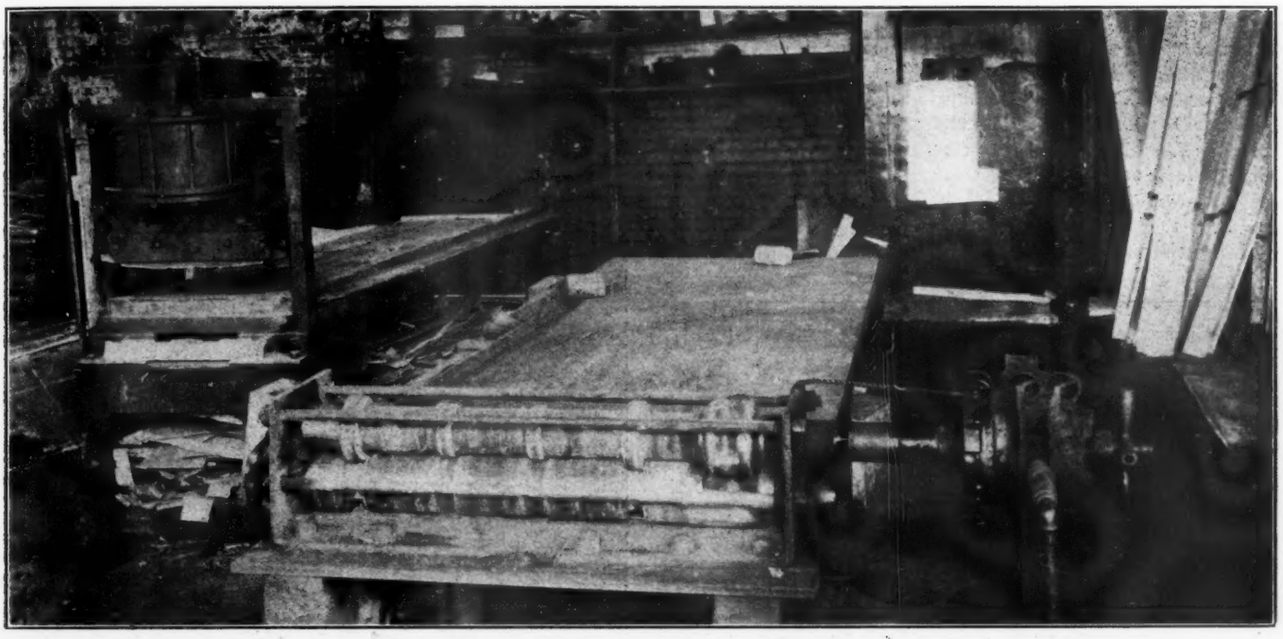


Fig. 22—Cutter and Rolls for Roofing Material.

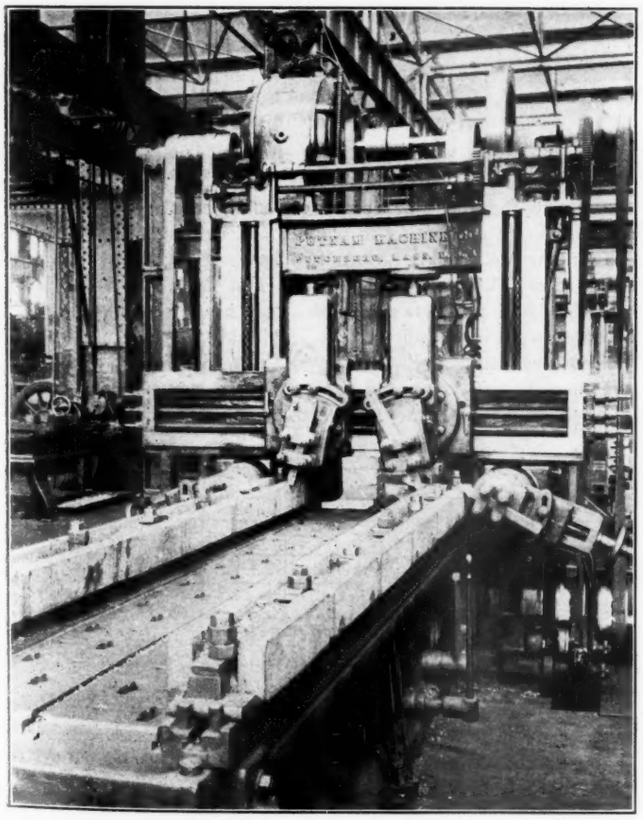


Fig. 23—First Operation in Planing Shoes and Wedges.

The form at the extreme right of the roll cylinder is used for shaping the ridge pole sheet. The other four are used as one form in shaping the roof sheets. The roofing sheet cutter has an air cylinder mounted on a metal cross-piece that is bolted to the two uprights, which also act as guides for the crosshead carrying the blade. The contour of the blade edge is shown, as is the shape of the cut sheet, one of these being placed on edge below the lower knife.

MACHINE SHOP KINKS.

PLANING SHOES AND WEDGES.

The work of planing shoes and wedges, as done at the Sayre shops, is of especial interest; the three photographs show all the processes from the rough casting to the finished one. As far as possible the number of patterns is reduced to a minimum in

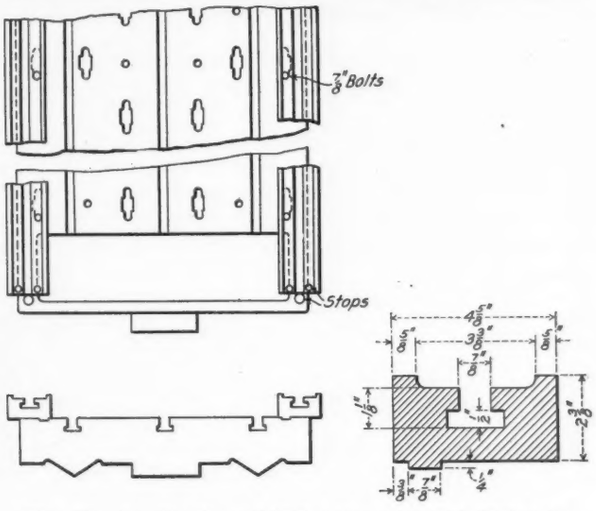


Fig. 24—Application of Extension Parallel Strips to Planer Table.

these shops. This, of course, requires the removal of a large amount of stock in some cases and it is questionable whether it is more economical to save handling a large number of patterns in the foundry, or save the additional time required in the machine shop to remove the surplus stock. Shoe and wedge castings illustrate this minimum-pattern idea strikingly.

A Putnam planer as used in the first operation of this work is shown in Fig. 23. In order to use the four heads of the machine at the same time it was necessary to apply two permanent extension parallels to the platen. The application of these is plainly shown in the photographs. It is also clearly shown in the drawing, Fig. 24, together with a cross-section detail of the parallel. This provision allows the use of the two cross-rail heads for machining the tops of the flanges and the vertical work on those sides toward the center of the platen, while the side heads do the outside vertical sides. As is seen, the castings are held free of the machine bed and are finished on the top of the flanges and

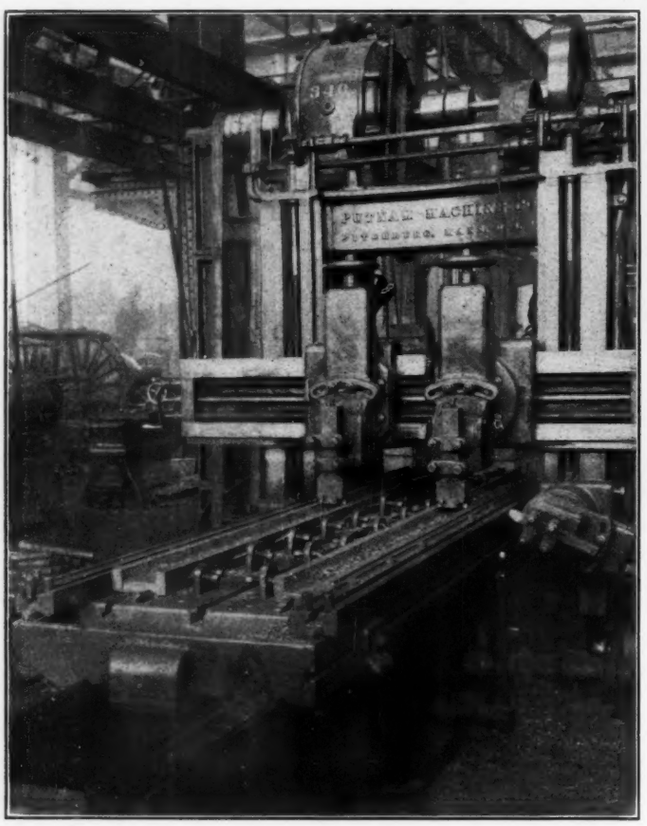


Fig. 25—Planing the Inner Sides of Flanges and Face of Shoes and Wedges.

the sides at one setting. The parallels are made of iron or soft steel and extend the full length of the bed. A special slot is cut in the bed to receive the lug on the parallel. Two permanent stops are provided against which the castings are clamped. The shoes are placed on the parallels as shown, with a clamping bolt between each pair.

After the outside surfaces are machined, the castings are rechucked as shown in Fig. 25. They are held against sliding by stops in the platen and are forced against the parallel strips by the set screws and chisel points. Two-cutter tools are used for machining the flanges and an ordinary tool on the horizontal surfaces.

After being layed-off, the final operation is handled on the machine shown in Fig. 26. Two small parallel strips are used for supporting and adjusting the casting. The drawing, Fig. 27, shows a detail view of one of these parallels. The wedges are adjusted by set screws, the work being very quickly performed. The casting is clamped firmly in position by the set screws and chisen points, and heavy cuts may be taken.

PLANING CROSSHEAD SHOES.

A two-bar cross-head chucked on a planer bed in position for planing the babbitted shoe is shown in Fig. 28. The tool used is 4½ in. wide. Some of the shavings removed are seen to be

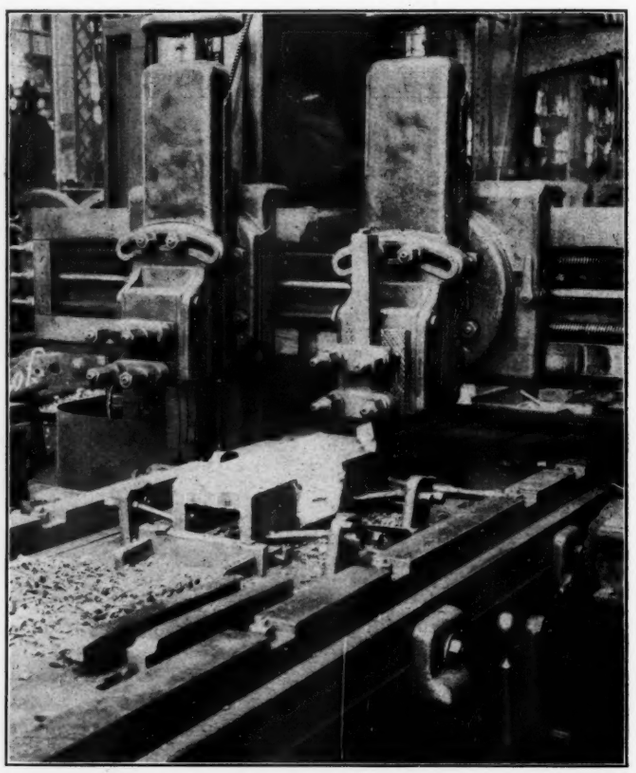


Fig. 26—Final Operation in Finishing Shoes and Wedges.

wide and heavy. It acts largely as a scraping tool and makes a true, even finish, with no possibility of gouging into the soft metal.

PLANING AND DRILLING ECCENTRICS.

Owing to the shape of eccentrics, it is necessary to use jigs to secure rapid production in planing and drilling them. In the photograph, Fig. 29, are shown two box-section plates used for this purpose. The half-eccentrics are first drilled to a template to fit the ⅜-in. plugs, two of which may be seen on the side of the upper plate in the photograph. The halves are then clamped to the plates, fitting over these ⅜-in plugs. Each face plate will accommodate six halves, and two such plates are put end to end, on a planer at one time. After the planing is completed, the

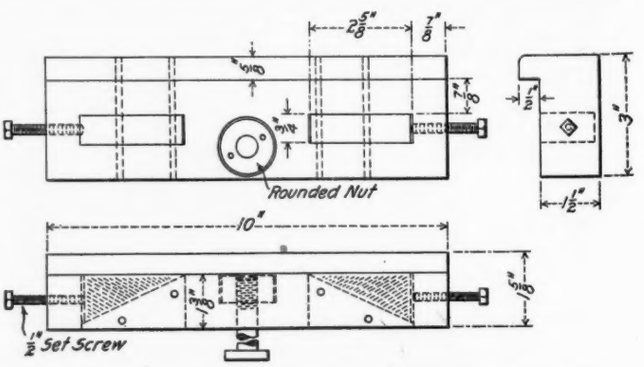


Fig. 27—Device for Supporting and Adjusting Shoes and Wedges for Final Operation.

face plates, with eccentric halves still clamped to them, are taken to the drill press for drilling the large bolt holes.

TURNING ECCENTRICS.

A 52-in Bullard vertical boring mill and an eccentric clamped in position for turning are shown in Fig. 31. The drawing, Fig.

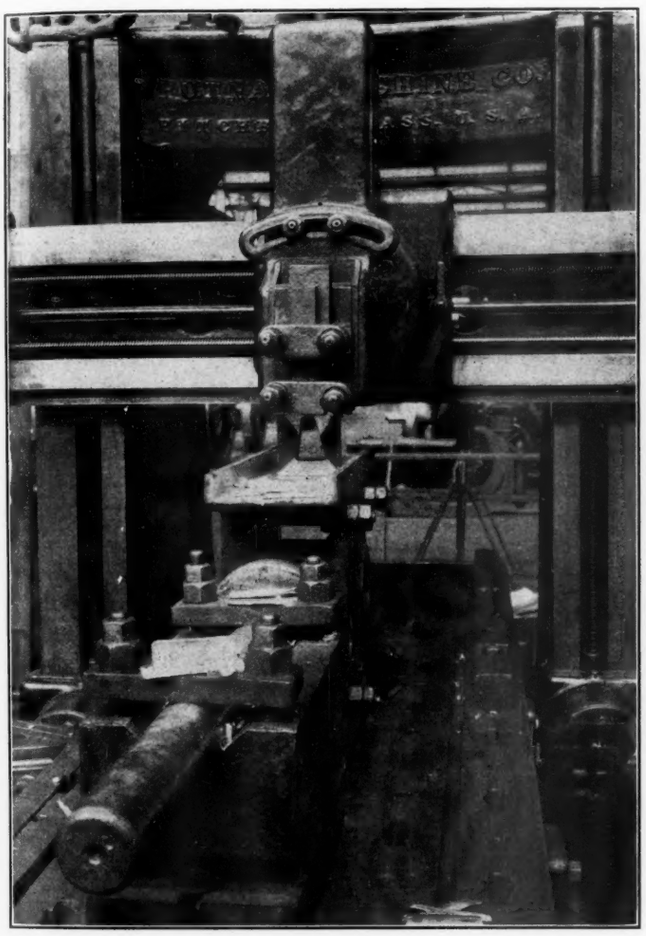


Fig. 28—Planing a Babbitted Crosshead Shoe.

30, shows the detail dimensions of the chucking plate and the clamping sectors. New eccentrics are first bored to minimum axle fit diameters and are then placed on the chucking mandrel for boring, using two tools, one for roughing and the other for finishing. The chucking mandrel consists of a base plate made of soft steel, and four cast iron sectors that are expanded by a conical wedge. The base plate has a lug that fits in the slot on the table. There are several 7/8-in. holes shown near one end of the base plate to provide for 4-in, 4½-in. and 5-in. throws, by moving the base plate along the slot. Several holes have been drilled in the bed of the mill to correspond to the throw holes in the base plate, and a plug is used to locate the base plate.

Fig. 29.—Jigs for Planing and Drilling Eccentrics.

The eccentric is fastened to the base plate by the expanding bushing, the four sectors and the conical wedge. It is held from turning by a plug that is driven in the base plate so that the rib will fall central. The machine on which this work is done is used exclusively for boring eccentrics and turning rod brasses.

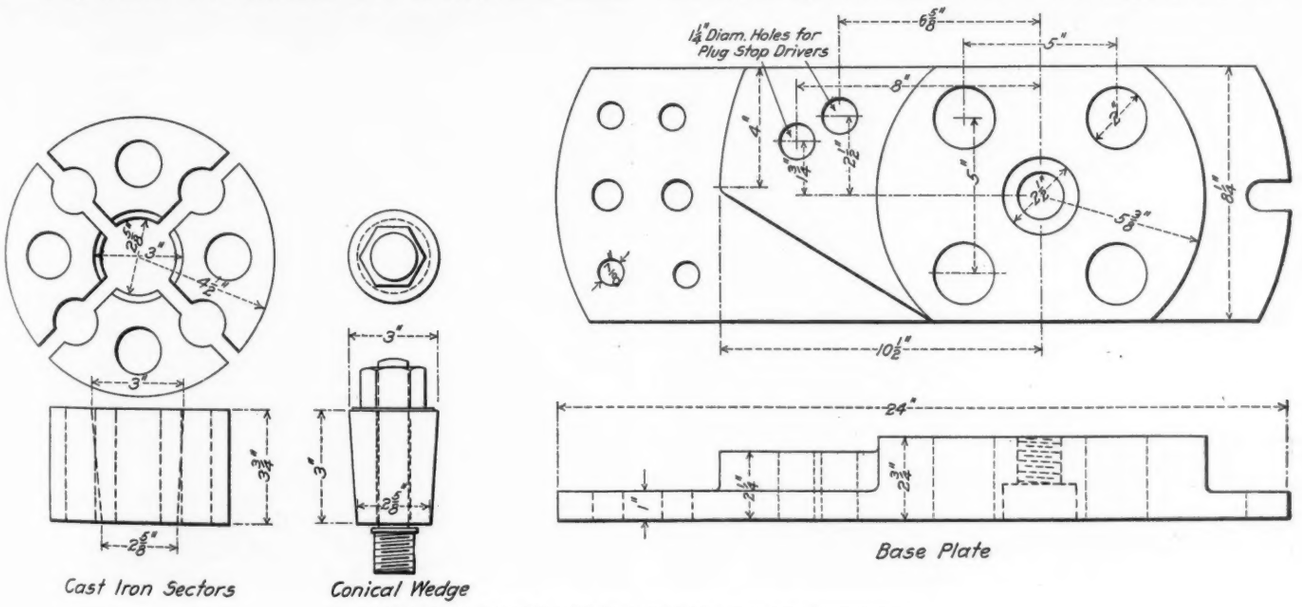


Fig. 30—Details of Mandrel for Turning Eccentrics.

BORING CYLINDERS AND CYLINDER BUSHINGS.

A Barrett Bros.' horizontal cylinder boring machine, used exclusively for boring cylinders and cylinder bushings, is shown in the photographs, Figs. 32 and 33. The V-s., adjustable for 12 to 40-in. diameters, rest on cast iron parallels which are bolted to the bed of the machine. They also move longitudinally on the parallel strips, having wide feet to give stability and to provide for the holding bolts. Both cylinders and bushings are bored and faced to length on this machine. The boring head was designed and made at the Sayre shops. Fig. 34 shows a face view of this head with the bar drawn back. Provision is made for using six tools. Each one is adjusted by a screw, the end of which is shown. The lower end of the screw adjustment carries a right-angle hook against which the cutter rests. The tools are set out the proper distance from the head by measurement, so that it is not necessary to run trial cuts and caliper the cylinder or bushing.

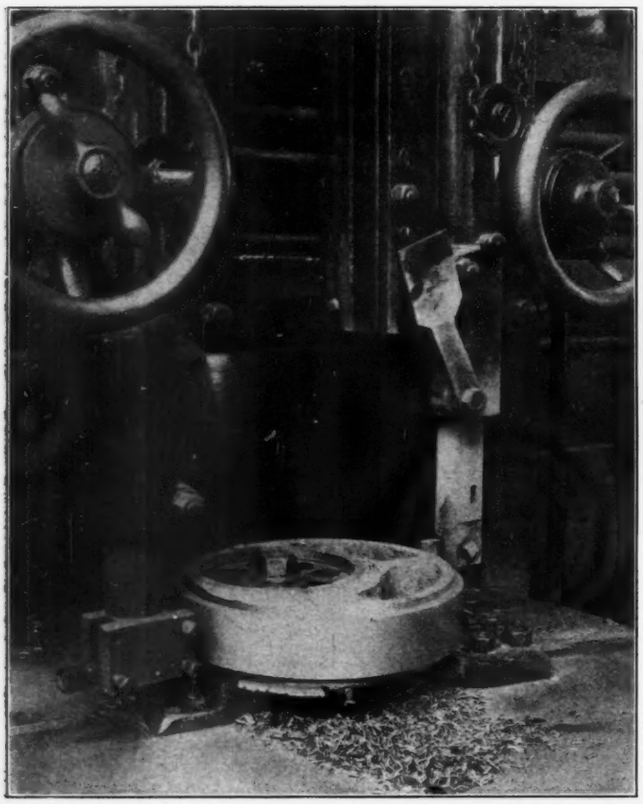


Fig. 31—Application of Mandrel for Turning Eccentrics.

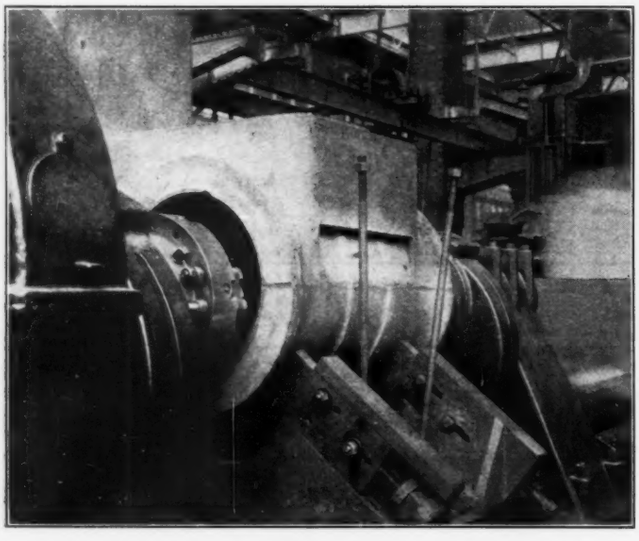


Fig. 32—Cylinder in Place for Boring.

TIRE BORING CHUCKS.

Tire boring chucks, which in a general way resemble those used on truck and passenger car tires on the Long Island (*Railway Age Gazette,* November 4, 1910, page 856) are shown in the accompanying photographs, Figs. 35 and 36, and the drawing, Fig. 37. The machine used for this work is a 96-in. Niles-Bement-Pond boring mill. There are six chucks in a set, made of cast iron and having a soft steel swinging clamp and a tool steel toothed-plate which assists in gripping the tire. The chucks are fastened to the table by three 1¼-in. T-bolts each. A lug

Fig. 33—A Cylinder Bushing About to be Clamped Preparatory to Boring.

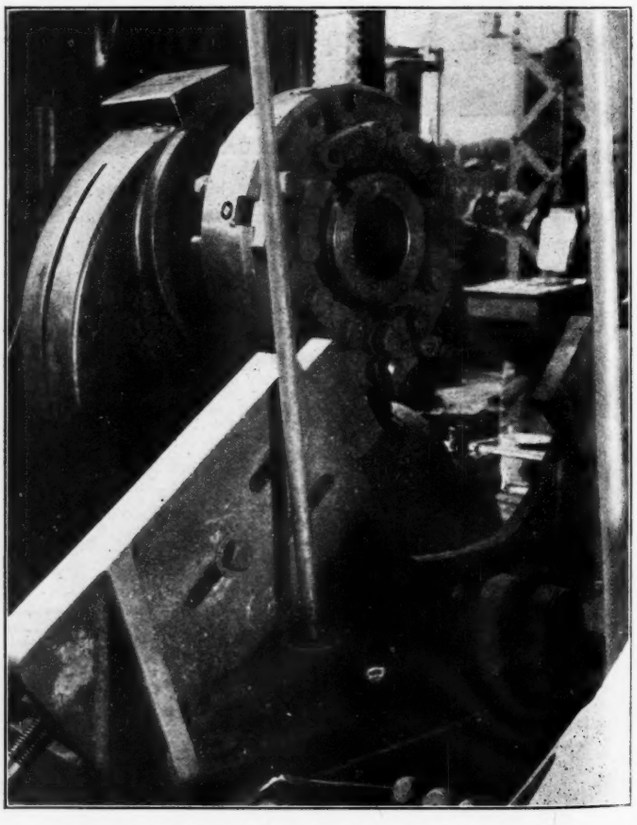


Fig. 34—Boring Head of Cylinder Boring Machine.

is cast on the bottom side of the chuck to fit the slot in the table. It will be seen that one side of the chuck is about twice the width of the other. This was necessary to provide stock for the set screw used in adjusting the tire to a central position on the machine. The soft steel C-clamps are made to swing back on the pin near the base. The shop crane is used in handling tires to and from the machine; Fig. 35 shows the chucks in position for placing or removing a tire. Two tools are used, a roughing and a finishing, and a tire is bored complete in one operation.

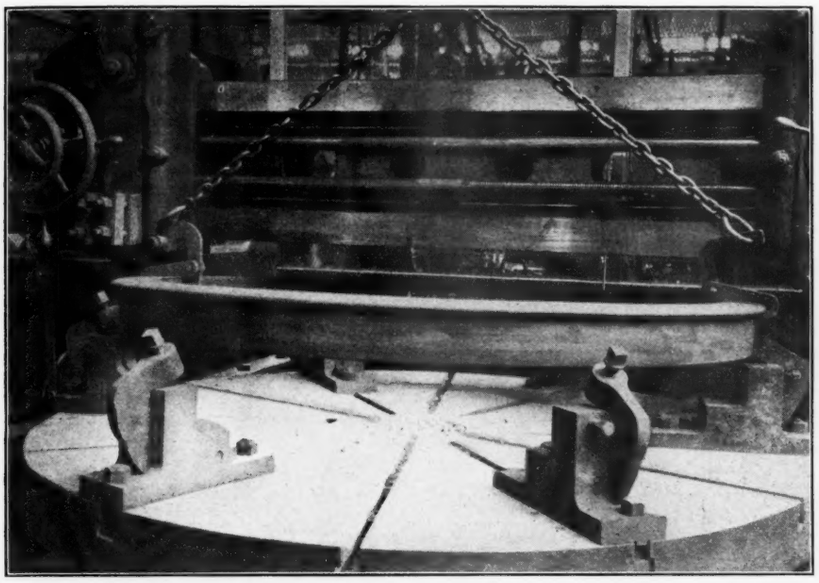


Fig. 35—Driving Wheel Tire About to be Placed in the Chucks.

Fig. 36—Chuck Holding Tire.

THREADING RADIAL STAYBOLTS.

Radial staybolts are ordinarily threaded on a small engine lathe, especially on the head end of the bolt. At the Sayre shops this work is done entirely on bolt machines. The bolts are stripped and the taper fit and facing of the head are done on a horizontal bolt machine, the dies having extensions for making the nick under the head. The bolts are threaded on a vertical machine. The lower head carries the bolt, gripping it on the square end; the movable head carries the chasers, and is let down from above. In cutting threads close to the head, it is necessary to provide a device for tripping the dies. This device is shown, as it is about to operate, in Fig. 38. It allows the dies to approach within 1/32-in. of the head of the bolt, when they are opened.

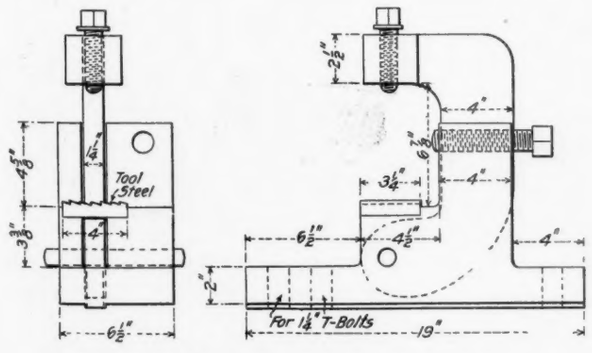


Fig. 37—Details of Chuck for Boring Tires.

PISTON ROD OIL HEATER.

It is not necessary to heat sprung piston rods in the blacksmith shop and hurry them to the lathe centers for straightening, when a heater similar to the one shown in Fig. 39 is used. The oil supply is kept in the reservoir mounted under the furnace, and the furnace may be easily rolled alongside of the machine.

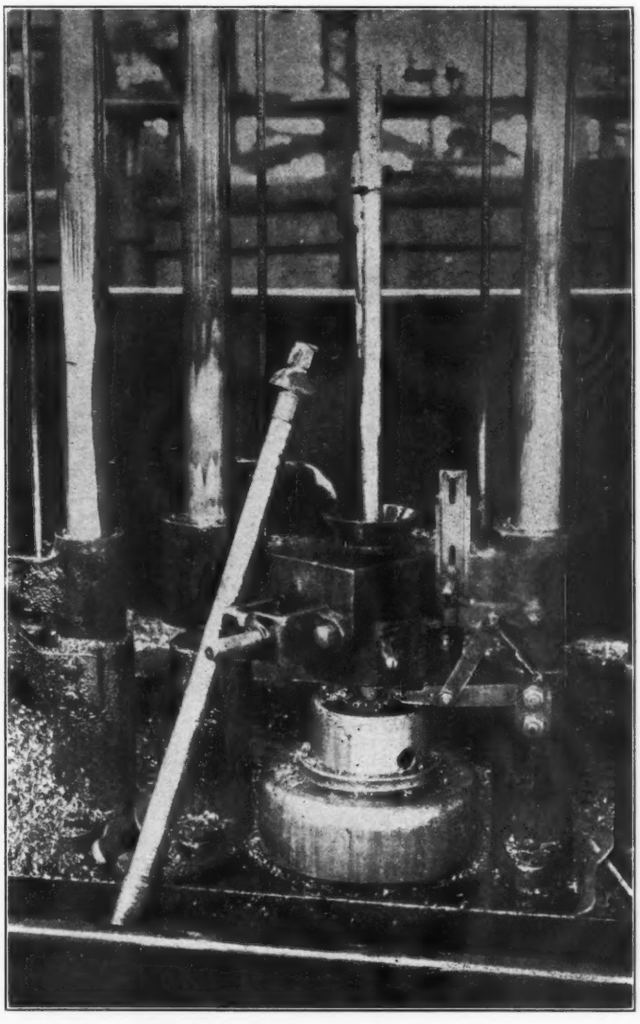


Fig. 38—Threading Radial Staybolts.

Fig. 39—Oil Furnace for Heating Piston Rods Preparatory to Straightening in Lathe Centers.

Fig. 40—Rack in Tool Room for Cutting Tools.

TOOL RACK.

To avoid having a number of cutting tools of the same kind at each machine, it was decided to issue tools for immediate use only, which has had the effect of better maintenance of the tools

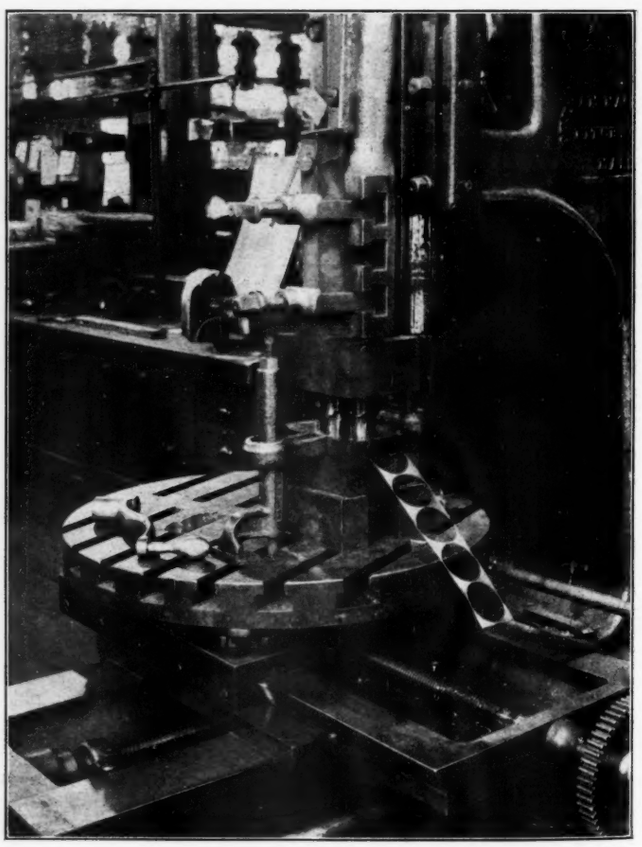


Fig. 41—Punch for Copper Gaskets, as Used on a Slotter.

and a uniformity of cutting edges for the several kinds of work. All grinding is done in the tool room and by one man, who works to a set of standard shapes. When a machine operator desires a new tool, or a freshly ground one for a dull one, he applies at the tool room window and is given a new tool or a sharp one in exchange for the dull one. These tools are kept in the rack shown in the photograph, Fig. 40. Each pocket is numbered, and as the tools are numbered accordingly, they may be called for and delivered by number. A tool room attendant who is not familiar with the shop names of the tools, or the uses to which they are put, is thus enabled to hand them out properly.

COPPER GASKET PUNCH.

Copper gaskets are made with the punch shown in Fig. 41, on a Putnam slotter in the tool room. The lower die block is clamped to the bed of the machine, while the upper one, carrying the two punches, is held in the sliding head. The two punches provide for making a gasket at each stroke of the machine. The sheet copper is fed in at one side; the small hole is punched first and the large one next, after which the gasket falls through to the table. There is a small stop provided on the side from which the sheet is fed, which acts as a guide to punch the two holes concentric.

MACHINING A GRATE BEARER CROSS-TIE.

Two positions of a grate bearer cross-tie on a double head slotting machine are shown in the accompanying photographs, Figs. 42 and 43. The first one shows the cross-tie in position for machining the frame fit. There are two parallel blocks used for this work. The lower one is clamped to the bed of the machine and the upper one swings above the lower one and on the bolt, the head of which may be seen at the far end of the lower block just beyond the slot. The opposite, or near end, of the top parallel is provided with a set screw. By this means it is possible to square up the two ends of the cross-tie. When machining the ends of the feet the top parallel is swung up out of the way and the cross-tie is turned on edge and allowed to fall in the slot in the lower parallel. The foot is then held against movement by the clamp, as shown.

PISTON VIBRATING CUPS AND PACKING RINGS.

The shouldered piston rod is used on most of the locomotives on the Lehigh Valley, this being done to get a large crosshead fit. It necessitates the use of packing having a split vibrating cup, and the work of machining these cast-iron cups on a Gisholt turret lathe, is of considerable interest. The first operation is shown in Fig. 44. The cup casting is made in halves and the edges which fit against each other are shaped off before the turret lathe work begins. Stock is made the length of two vibrating cups. The illustration shows the first stage of the work completed, that of machining the outside of one cup. The snap gage used for this work is shown on the carriage of the machine. It will be noticed that a four-jawed chuck is used for this work. It was formerly performed with a three-jaw chuck, but it was necessary to drill and dowel the halves before putting them in the machine. This not only required time, but castings were very often ruined by having the small drills broken off in them.

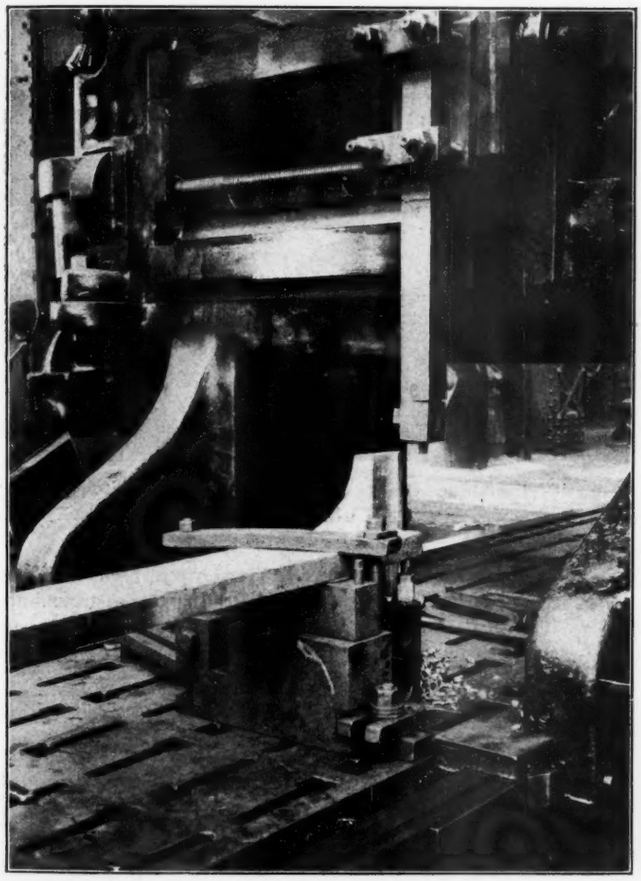


Fig. 42—Slotting the Frame Fit on a Grate Bearer Cross-Tie.

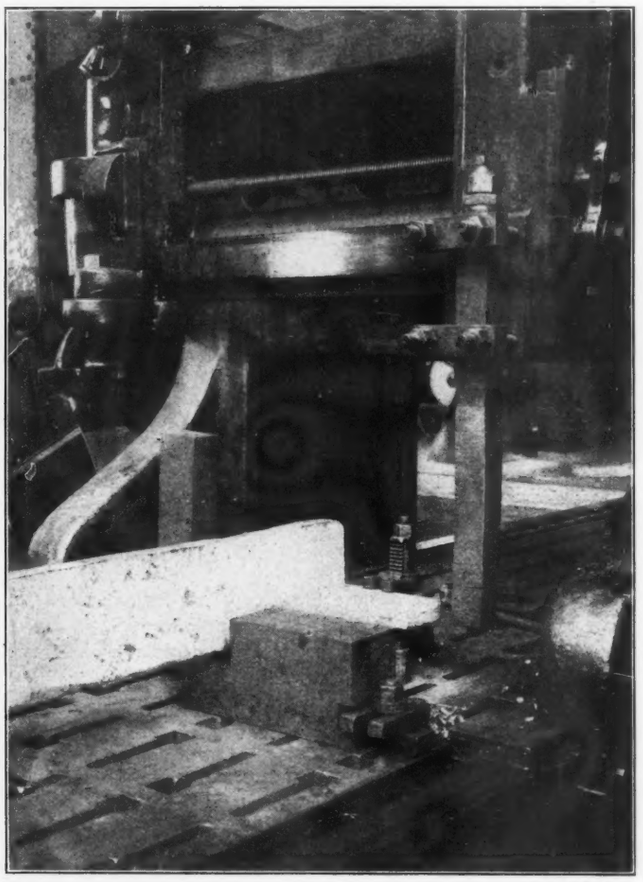


Fig. 43—Slotting the End of a Grate Bearer Cross-Tie.

The second operation is illustrated in Fig. 45. At the completion of the first operation, the chucking sleeve, shown in Fig. 45, is placed in the machine. The inside contour of this sleeve corresponds with the outside of the vibrating cup. The second cup is then machined to the snap gage and is cut from the one in the sleeve with a parting tool. The second photograph shows the cup just after it was cut off.

Fig. 46 illustrates the operation in which the cup is machined on the inside. Still clamped in the split sleeve used in the previous operation, an ordinary roughing tool is used to cut away

the sandy rough cast iron. Then two forming tools are used, the roughing one of which is shown on the tool turret, and the other in position in the turret. This shaping is done to the snap gage shown on the machine, near which are the halves of a finished cup.

This vibrating cup, when used, fits into a brass vibrating cup, the bore of which is made large enough to slip over the shoulder of the piston rod. These brass cups are machined on the same turret lathe, being gripped in the four-jawed chuck, extension straps on the jaws, however, being necessary. The two forming tools used are shown in Fig. 47, as is a completed cup and a completed combination of the brass and cast iron cups.

An ingenuous tool for forming the inside face of the gland used with these vibrating cups is shown in front of the face plate, Fig. 48. The tool has five separate inserted cutters. The gland is, of course, first roughed out with a roughing tool.

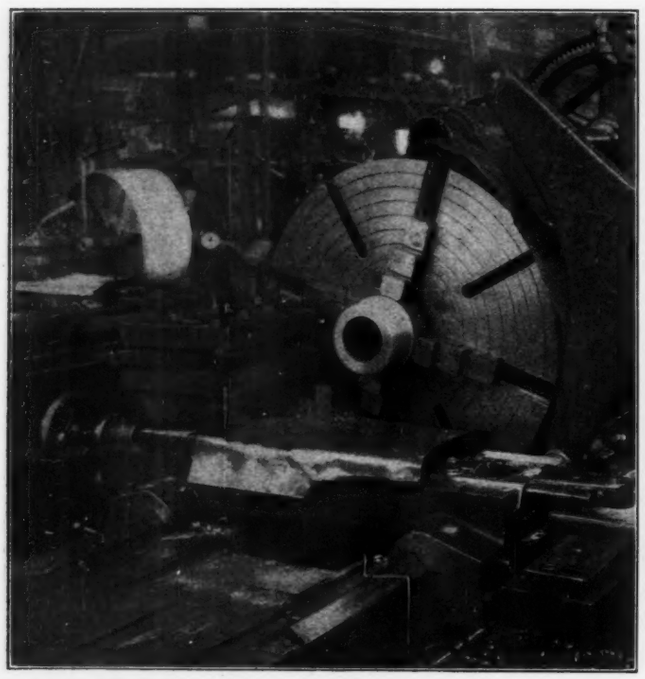


Fig. 44—First Turret Lathe Operation in Finishing Two Part Piston Rod Vibrating Cups.

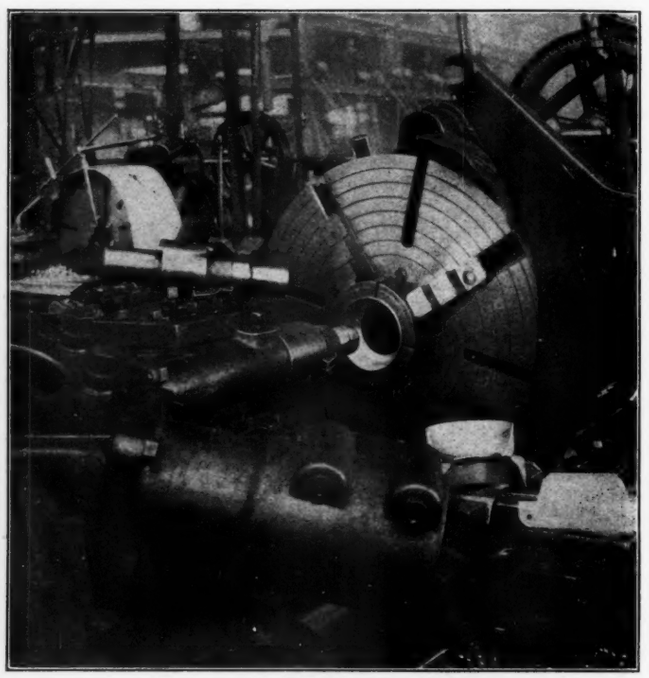


Fig. 46—Finishing the Inside of the Two-Part Piston Rod Vibrating Cup.

The machine on which the soft metal rings used with this packing are finished is shown in Fig. 49. In the foreground are shown the molds on which the packing rings are cast separate. Provision is made for casting 12 piston rod and six valve rod

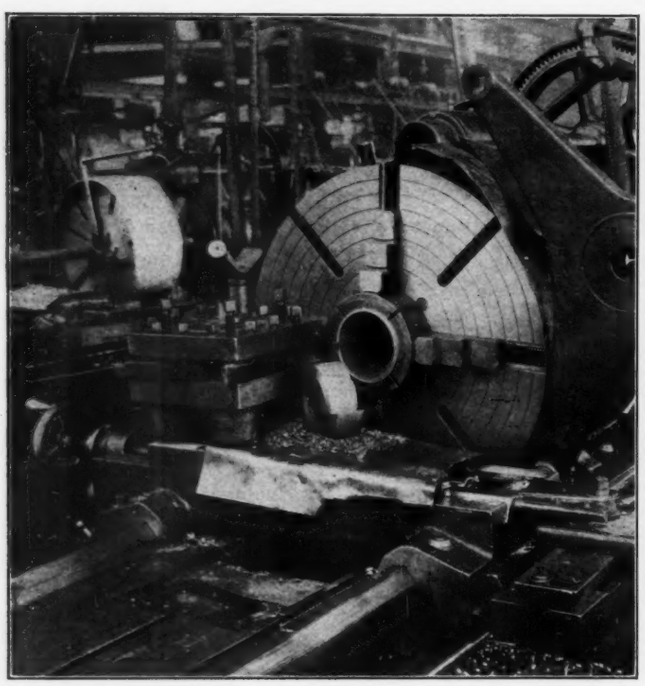


Fig. 45—Second Vibrating Cup Completed on the Outside and Cut from the First One.

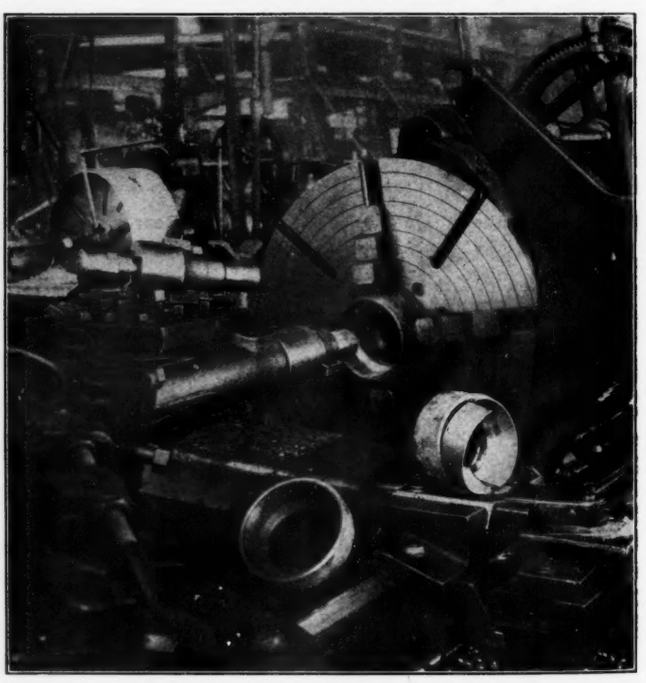


Fig. 47—Finishing the Inside of the Large Brass Vibrating Cup in which the Cast Iron Cup Fits.

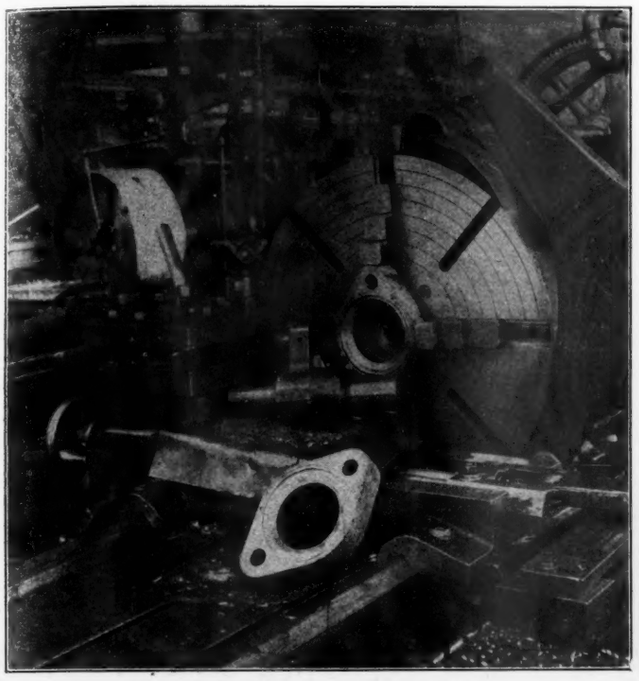


Fig. 48—Tool With Five Cutters For Finishing Inside of Piston Rod Gland.

rings at one pouring. After the metal is poured, the cores are raised, by the air cylinders, and the rings may be taken off to cool. Each ring is faced separately, and then a set of three is

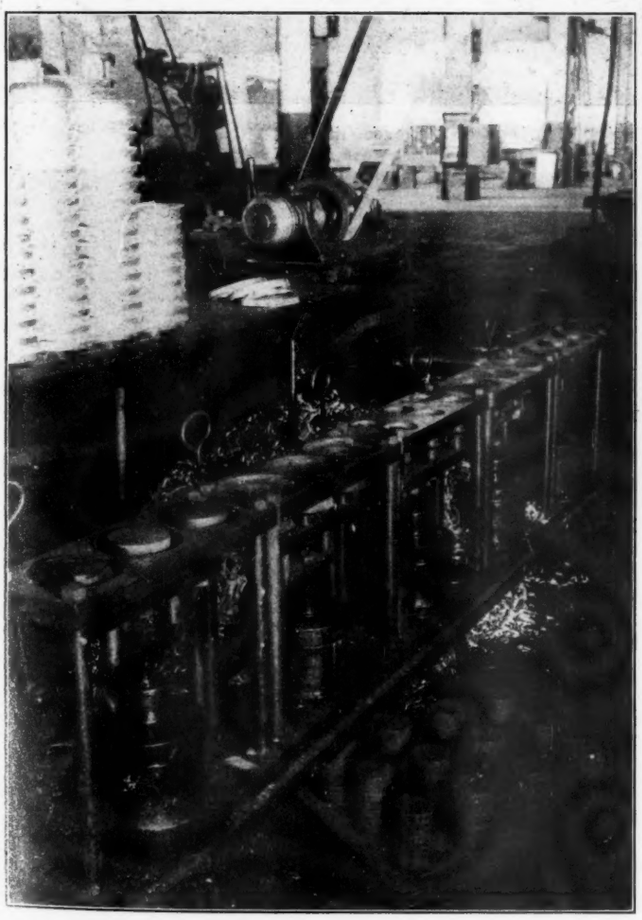


Fig. 49—Molds for Pouring and Machine for Finishing Piston and Valve Rod Packing Rings.

put on the expanding mandrel and finished to exact size and contour, using a broad forming tool. The spindle is equipped with a friction clutch, which is thrown in by the lever seen just over the work. This provides for rapid starting and stopping. On the floor is shown one of several boards that fit neatly into boxes in which finished packing rings are shipped to various points on the road.

CHIP BOX.

The work of removing machine cuttings from a large shop is an important item; the practice of having it done by laborers with wheelbarrows is expensive and is not entirely satisfactory. The photograph, Fig 50, shows a chip box, a number of which are located about the shop, especially near the large machines. These boxes are 36 in. x 36 in. x 36 in., made of ¼-in. boiler steel and will hold about 2 tons of chips. The practice is for each operator to throw the cuttings from his machine into a box. There is no difficulty in getting this done, as the mechanic

Fig. 50—Metal Box for Handling Cuttings.

shovels the cuttings up as they accumulate, his machine being supplied with the necessary broom and shovel. After working hours in the evening, the shop crane handles these boxes to a scrap car, which is run into the shop. The box has four grabs, and one side which is hinged at the top and has a latch at the bottom, provides for easily emptying the boxes when suspended over the scrap car and held by the two back grabs only.

TRUING REVERSE SHAFT BEARINGS.

With the design of reverse shaft shown in the 42-in. Pond lathe, Fig. 51, it is impossible to machine the bearing and use the regular tool slide-rest, unless a long tool be used so that the tool rest will clear the heavy link-arm in the center of the shaft. A tool of this length would not have the necessary stability for even light cuts, and the arrangement would be generally unsatisfactory. To overcome these difficulties, and to provide an

arrangement by which both bearings may be machined simultaneously, the extension tool-slide was designed. The two I-beams are bolted to the carriage of the machine. A rigid cross-bearer extends between the ends of the I-beams, to which it is braced by compression trusses, reaching from just below the tool post to the bottom edges of the I-beams. The illustration shows clearly how the work is done, the two tools being set for starting the cuts.

HANDLING SMALL STOCK.

An iron crate used for transporting small stock about the

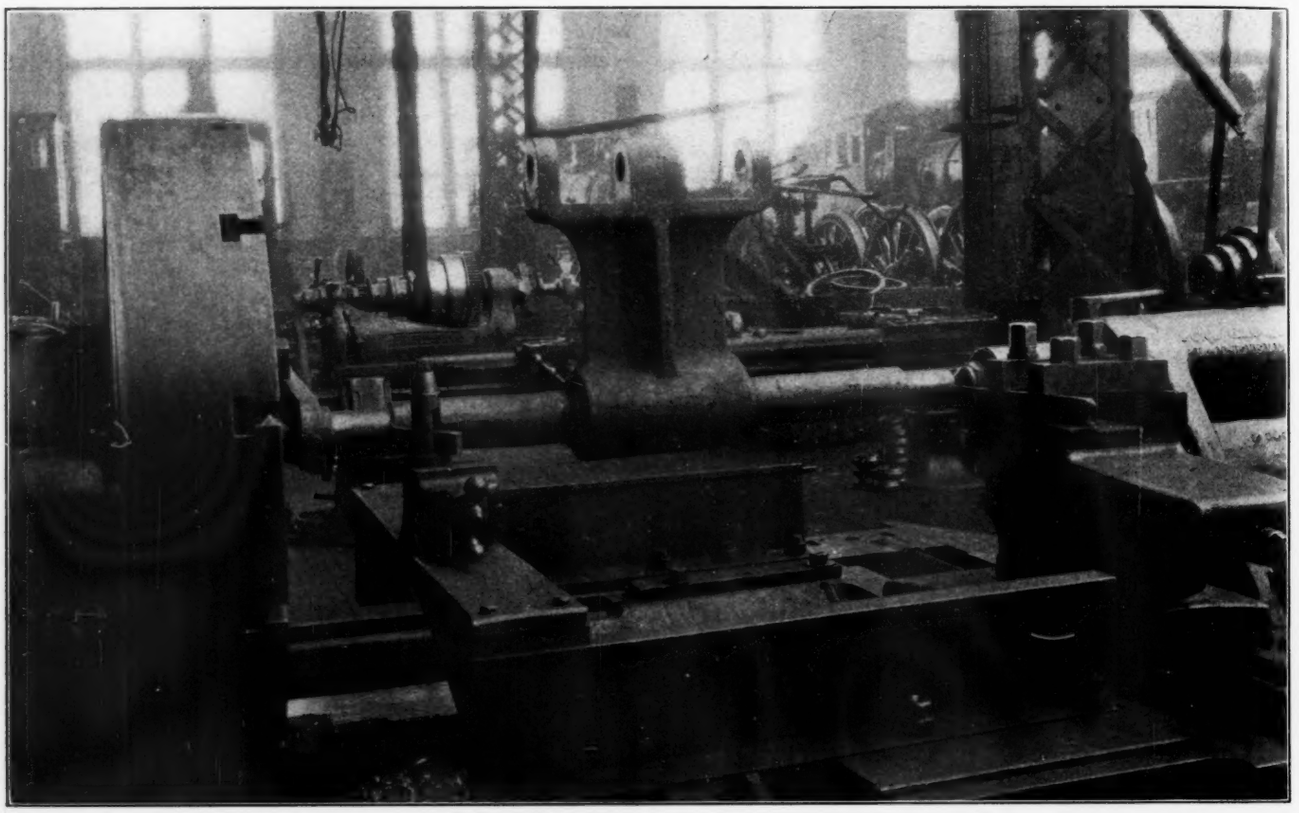


Fig. 51—Pond Lathe Fitted for Truing Bearings on Reverse Shaft.

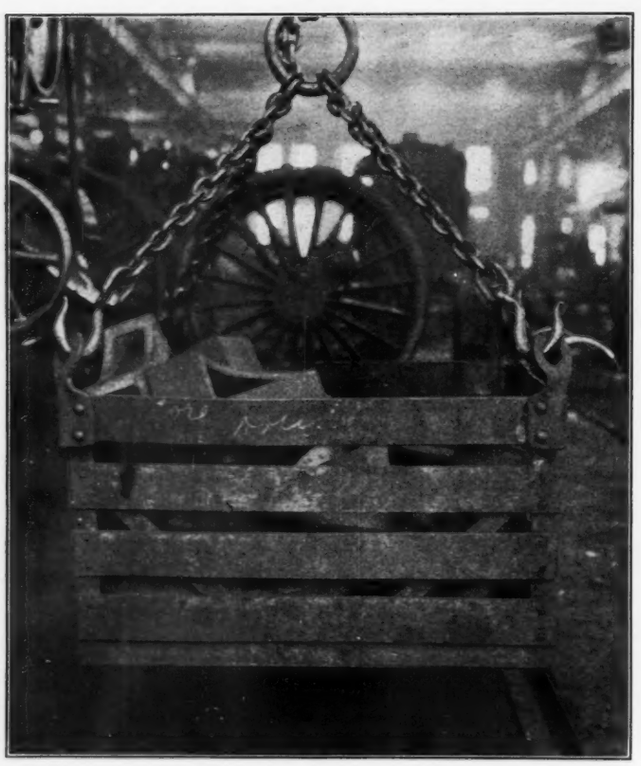


Fig. 52—Metal Crate for Handling Small Stock in Quantities.

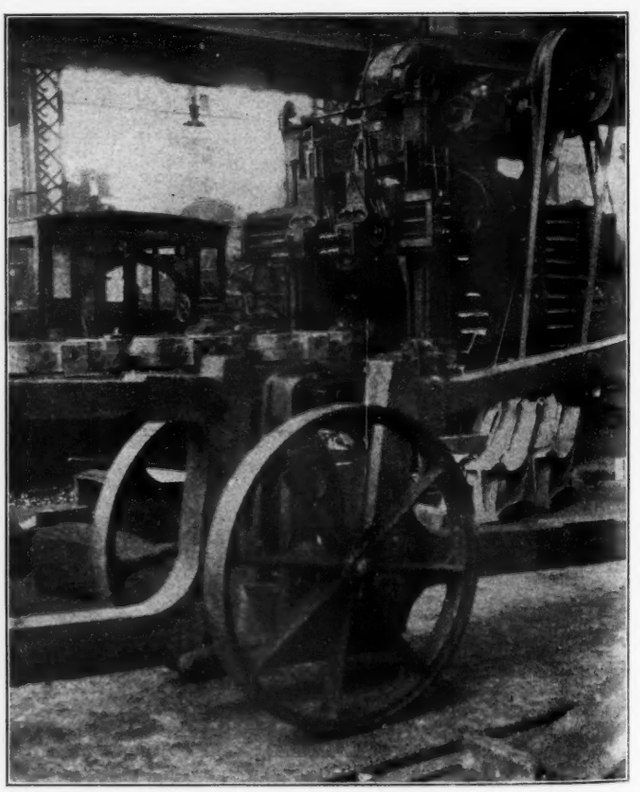


Fig. 53—Truck for Transporting Locomotive Frames.

shop in quantities is shown in Fig. 52. The crate is shown hanging from the large traveling crane. This method of handling is especially efficient with small pieces, such as bolts, and may

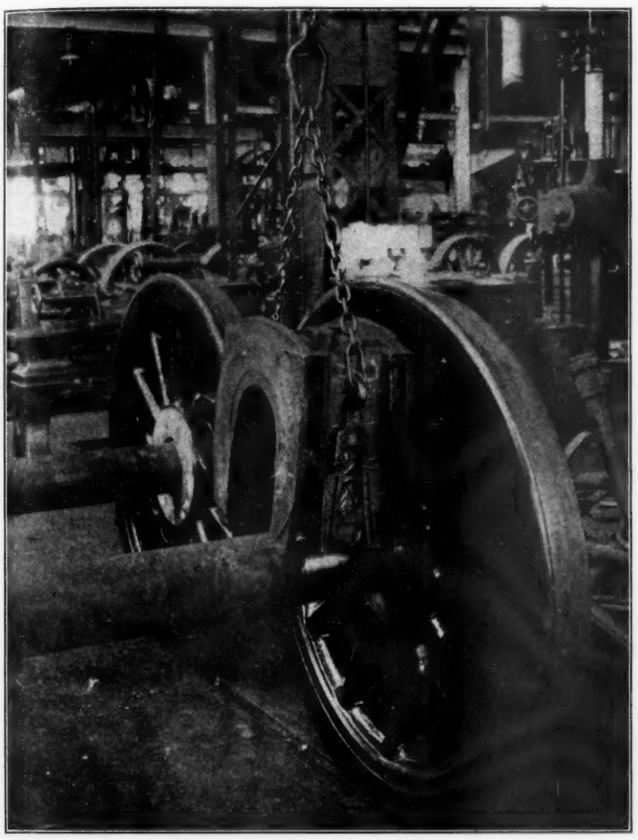


Fig. 54—Expanding Wedge Device Used in Handling Driving Boxes.

even be used advantageously for large pieces. A large number of crates are provided, so that they may be filled by the men doing the work on the pieces which saves extra handling.

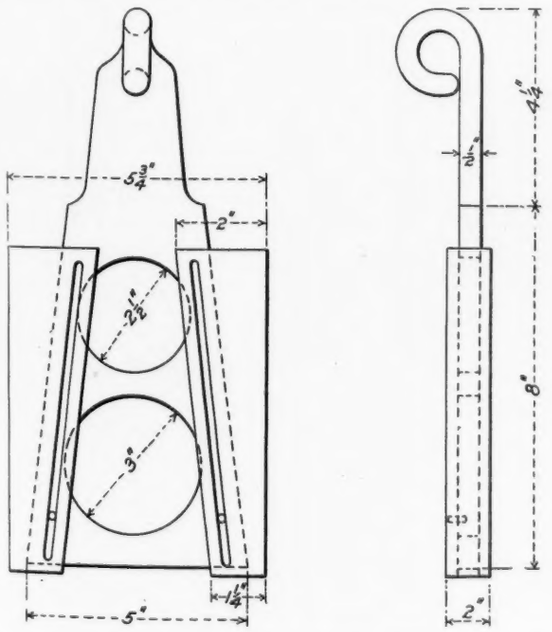


Fig. 55—Details of Expanding Wedge Used in Handling Driving Boxes.

LOCOMOTIVE FRAME TRUCK.

A relic of the days before the advent of traveling cranes is shown in the photograph, Fig. 53. Long locomotive frames are difficult to handle without crane service or when being taken to or from the blacksmith shop. The common method is that of using a hand car, but such a car is so wide that it is difficult to get it around the shop and between pits, besides it requires some ten or twelve men to handle a large frame in this way. The truck shown is made in two pieces and is held together by the rough bolt seen between the spokes of the wheel. It so happened that the balancing point in this frame fell in the center of one jaw, in which case it was necessary to use a block between the upper ends of the verticals, otherwise the lower frame rail would occupy that position. By balancing a frame on this truck, six men may easily handle the largest ones. This truck will be found especially useful in a small shop not having traveling crane service.

ERECTING SHOP KINKS.

HANDLING DRIVING BOXES.

An ingenious device, consisting of a pair of expanding wedges, is used for grasping the driving boxes while handling them with a crane. One of these is shown in use in the photograph,

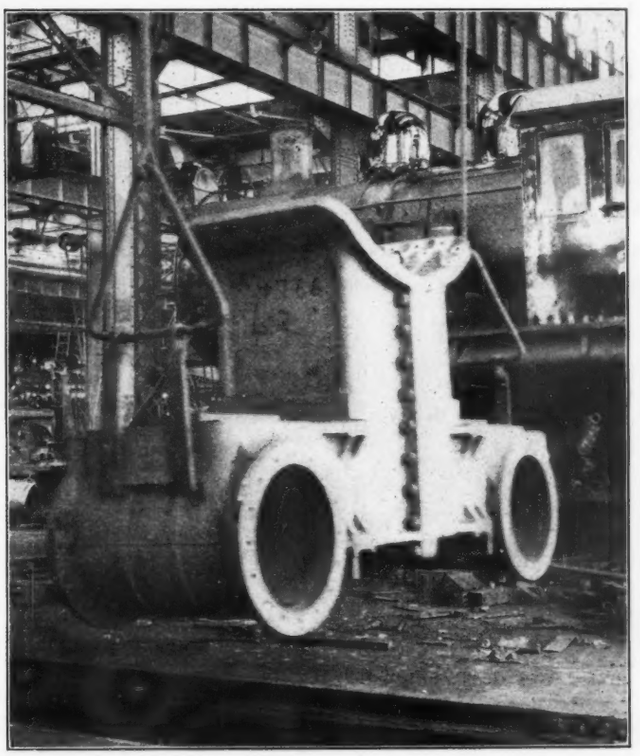


Fig. 56—Transporting Cylinders by a Traveling Crane.

Fig. 54, and in detail in the drawing, Fig. 55. There are two loose shoes, which slide on the edges of the wedge-shaped center piece, guided by two pins and the slots shown. The weight of the box serves to bind the shoes against the flanges of the box.

HANDLING CYLINDERS.

A pair of locomotive cylinders being handled by an overhead traveling crane is shown in Fig. 56. Advantage is taken of the cylinder design which permits the use of the hooks. There is a heavy cross arm above to which the crane block is attached. Cylinders are easily handled to and from the frames with this device.

TIRE AND FRONT END DOOR CLAMPS.

Simple clamps used in handling tires and front end doors with the shop crane are shown in Fig. 57. The tire clamps have hooks that grip the flange. The arm which bears against the inside of the tire has an extension end which, being bent outward, provides pressure, when the tire is lifted, on both the flange and inside of the tire. The clamp used on the front end door is similar to those often used for handling boiler plate. The hook, which grasps the door, is assisted by the lever action of the central piece. The third piece is not necessary. The chain may be attached direct to the lever, which is supplied with teeth on the other end that grip the metal.

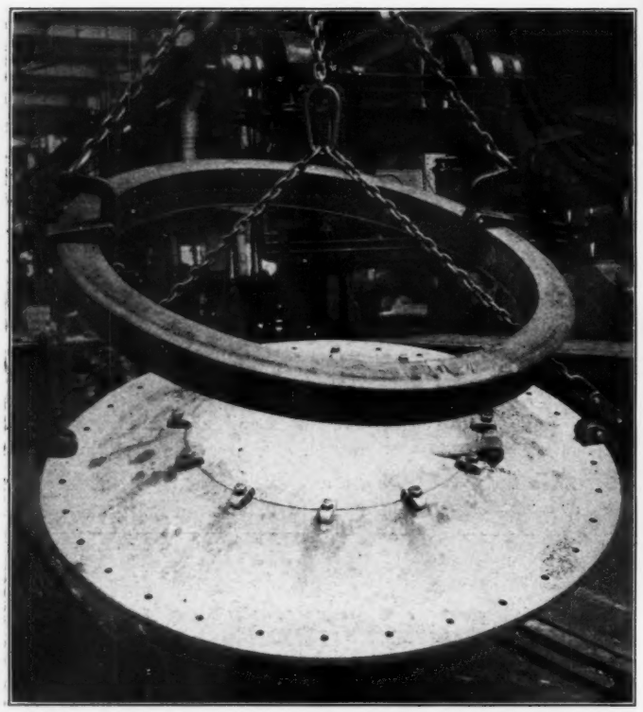


Fig. 57—Clamps for Lifting Tires and Front End Doors.

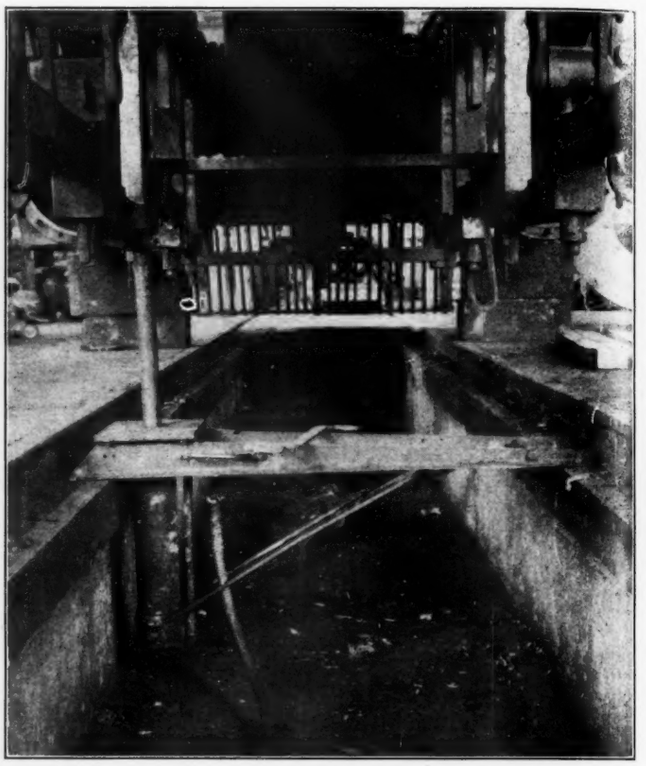


Fig. 59—Jack for Handling Heavy Pedestal Braces.

HANDLING STEEL CABS.

Steel cabs are conveniently handled about the shop by the crane and the device shown in Fig. 58. The cross-piece is made of a T-bar, the vertical flange of which is cut off at the ends and the bottom web is turned up for the chain connections. The

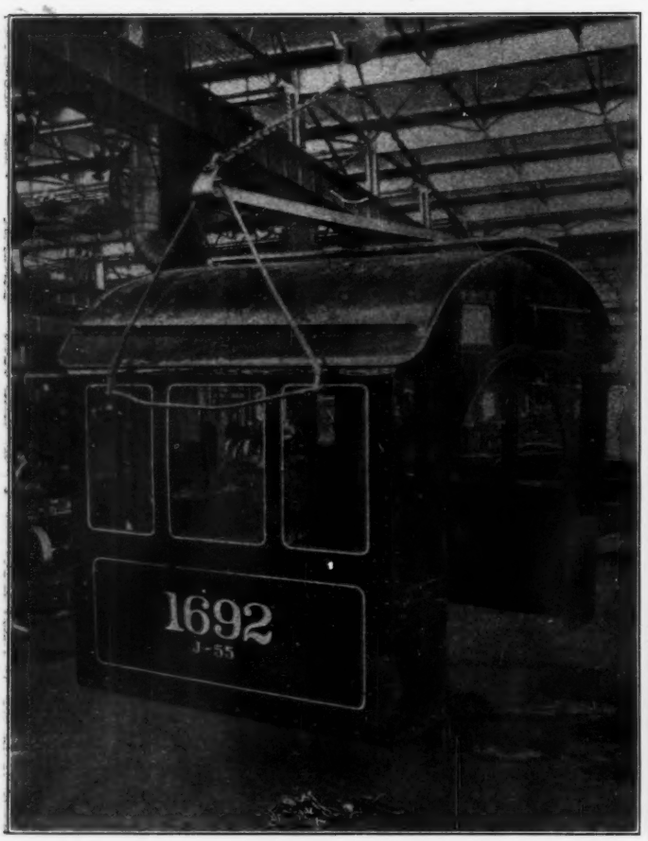


Fig. 58—Device for Handling Steel Cabs.

Fig. 60—Portable Rivet Forge for Use in the Erecting Shop.

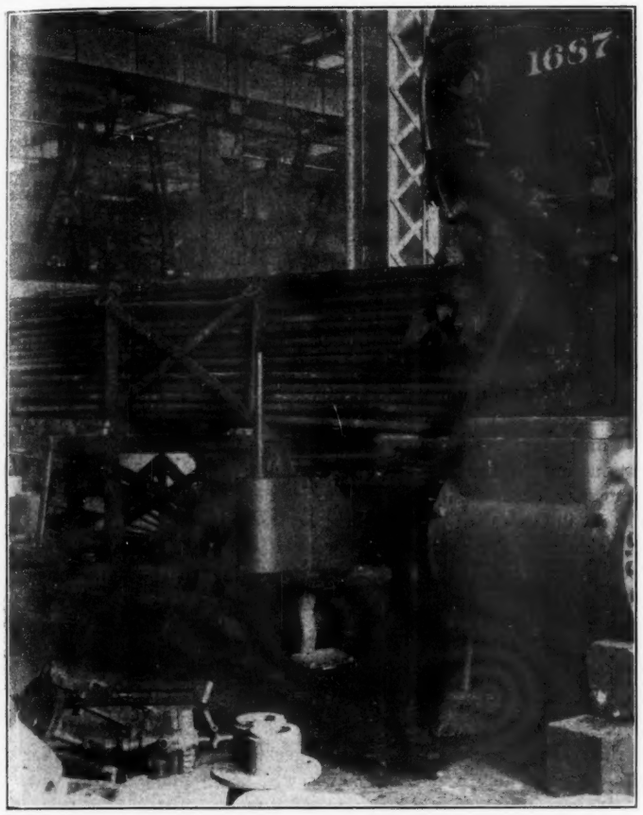


Fig. 61—Crate for Handling Boiler Tubes.

triangular arms hook in the windows and provide for handling a cab without injury to the newly painted and varnished surfaces.

JACK FOR PEDESTAL BRACES.

Raising and lowering heavy pedestal braces, especially when the wheels are under the locomotive, or when the work is being done in the roundhouse under a hot engine, is a most difficult job. A light, portable jack designed for this work and which is quite efficient is shown in Fig. 59. The cross-pieces are made of light sheet metal, made angular to provide stiffness. The air cylinder is mounted at one end and its piston carries a shoe —made from an ordinary engine step—on which the brace rests. In using, the brace is placed on the shoe, air is applied and the brace is carried up and held in place until the nuts are placed.

PORTABLE RIVET FORGE.

A handy, portable rivet forge, used in the erecting shop, is shown in Fig. 60. The hood is made of light sheet iron and rests on a framework, having three cast iron wheels, the third one being a guiding wheel. Coal is carried in the box and air pressure is supplied from the shop air line.

CRATE FOR HANDLING BOILER TUBES.

The crate of tubes shown in front of the locomotive in Fig. 61, illustrates the method of handling boiler tubes to and from the flue shop. When they are removed from the boiler, they are dropped into the crate, as shown.

LYE VAT.

The easiest and quickest method of cleaning the brake rigging, eccentric straps, link motion, driving boxes, shoes and wedges, binders, etc., is to put them in a cage which may be lowered into a lye vat, such as is shown in Fig. 62. As the Lehigh Valley

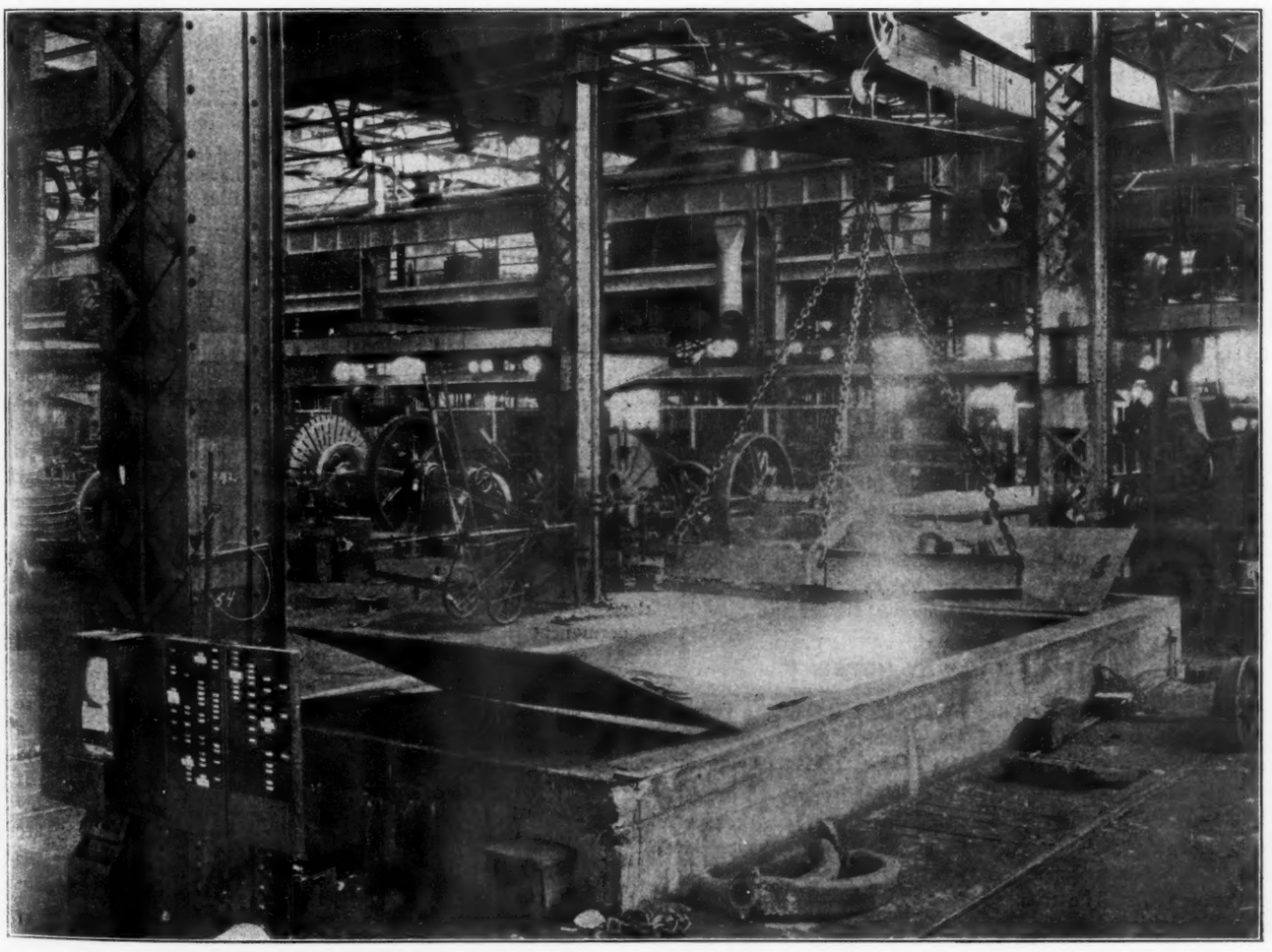


Fig. 62—Lye Vat for Cleaning Greasy Locomotive Parts.

shop provides two erecting floors, one on each side of the building, there are two of these lye vats. Each is 10 ft. wide, 30 ft. long and 14 ft. deep. There are several coils of pipe arranged along the walls of the vat near the bottom. Live steam is passed through these coils for heating the solution. It will be noticed that the crate held suspended above the vat, is handled by the shop crane and that the cover sheet is lifted with the crate. Locomotive parts are lowered into the vats and left there for about twelve hours, when they are taken out and flushed with cold water.

In the center of the photograph, just back of the vat, is shown a tire heater used for placing and removing tires. This heater was illustrated and described in the *Railway Age Gazette* of January 15, 1909, the information and photograph being supplied by J. W. Hamm, machine foreman. One of the gang checking boards and a time clock are shown at the left side of the photograph. Each gang checks separately, so that there are several of these boards and clocks about the shop.

STAYBOLT BREAKER.

Almost every collection of shop kinks that has appeared in these pages has included a staybolt breaker, and nearly every one has shown some points of advantage or particular merit. The breaker in Fig. 63, is shown, not to illustrate the ram action,

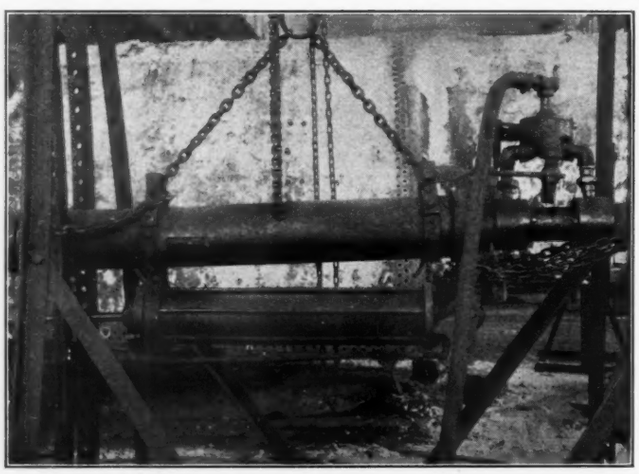


Fig. 63—Staybolt Breaker.

which corresponds very closely to others previously published, but to emphasize a feature which has not been found in the previous ones. The metal framework forms a carriage, or double A-frame, which is mounted on four small wheels. The ram is elevated and lowered by a block and fall fastened to the top cross arm connecting the two A-frames. Suspended below the ram cylinder, is an air cylinder, the piston of which is supplied with a hook. This arrangement provides for holding the breaker ram against the staybolt and for moving the carriage on after a bolt is broken. One man stands upon a platform on the carriage and operates the two air valves, one of which controls the carriage while the other applies air for the ram.

FOREIGN RAILWAY NOTES.

The Japanese Railway board has decided to build a narrow-gage electric tramway parallel and close to the standard-gage railway track from Yokohama to Tokio. This tramway may eventually be extended to Kozu and Kamakura.

The British consul-general at Port-au-Prince, Hayti, reports the passing by the Haytian legislature of the following law: Approving the plans submitted for a railway from Port-au-Prince to Pétion-Ville. The trains are to be run by electric traction, and fitted with automatic brakes. Interest is guaranteed by the government on about $223,000.

CORPORATION SCHOOLS.*

BY G. M. BASFORD.

While listening to a fine orchestra, do you ever think of the organization necessary to the production of its music? Is it possible to suggest a better illustration of perfect individual skill combined in coöperative effort to produce a definite, highly prized result? A result similar in principle is desired in many organizations requiring thousands of men, such as are necessary today in manufacturing and in transportation, and in which it is impossible to secure ready made recruits. If the orchestra leader may be represented in our minds for a moment by the employing officer of a manufacturing organization taking men who apply at the gates for work, how many would he find capable of performing any part whatever in the harmonious performance which he so greatly desires to produce?

Unfortunately fluctuations occur in present day methods of conducting business. Employers of labor find it absolutely necessary occasionally to add to forces which have been depleted in times of depression. In reducing forces the most valuable men are retained. When orders come again and more men are wanted, those who apply for work are asked the question, "What can you do?" Of 1,666 men recently applying for work at the gate of a plant employing about fifteen different trades, only 134, or eight out of each 100 men even pretended to be anything more than unskilled laborers. However, upon such men manufacturers depend for a large part of their output. Unskilled men do, in time, become skilled upon some one, or perhaps two, operations, but the great and pressing need for skilled mechanics is not and never will be supplied in this way. It is impossible to believe that any manufacturer can prefer present prevailing methods to a consistent and sensible system of apprentice training, especially when apprenticeship is so simple, so easily installed and so satisfactory.

People are beginning to understand that the industrial progress of Germany is not due to her superior technical education methods so much as it is due to her consistent adherence to apprenticeship. Technical education has done much in Germany, but without the substructure of workmen skilled through apprenticeship, the education would not have brought that country to its present position. We know that Germany does not depend upon trade schools, as we understand the term, but upon apprenticeship, upon continuation and improvement schools, for skilled and intelligent workmen. These continuation schools are attended by apprentices and the improvement schools by those who have completed apprenticeship.

We need skilled workmen who understand their work and its relations to the work of others, and who are prepared in citizenship to take their places in the organization of human life. To supply the need we must train the hands and the minds of our recruits. The present emergency seems to compel us to take the school to the boy for the training of the mind. Our greatest work is in the shop. The boy is in the shop and we must move the school to him for we cannot move him to the school. We cannot wait for the educators to adapt themselves to our problem, but must take it in hand ourselves. Hence the corporation school. Whether or not the corporation school is permanent is a question which may be safely left to the future. At present it meets an urgent need and will meet it until coöperation with public schools may be effected.

It meets the need because the boys who come to us are those who must work every possible working hour in order to make a living. They cannot afford to go to school. Even if they could learn trades in trade schools they cannot afford to do so. It is most direct and definite educational work. The boys know what they want to do in life and they are doing it. They are learning to use their hands under the direction of skilled teachers of their trades, and the training of the mind naturally asso-

*An address delivered before the National Society for Promotion of Industrial Education, Boston, Mass., Nov. 18, 1910. Mr. Basford is assistant to the president of the American Locomotive Company.

ciates itself with the training of the hand. Because the boy is making his place among men while acquiring his education and is educated in his work while at work, this type of school surpasses all others in directness, definiteness and in conservation and concentration of the attention of the mind of the boy. To these advantages another of great importance is added. The boy does not finish his school work and then find it necessary to establish himself in a working position. He is already in such a position and is fitting himself daily the better to fill it and prepare for advancement. He is already making friends of his superiors who are beginning to rely upon him in the organization. Trade school boys and even technical school graduates do not enjoy this advantage. For these reasons the responsibility of those in charge is great, because the possibilities of achievement are limited only by the scope of the plan and by the sincerity and the ability with which the work is carried out. It may be narrow or it may be broad. It may be selfish or it may be generous. Before many years some of those now in these schools will occupy positions of authority. They may be trusted to improve upon the best plan that we now are able to present, for they will understand better than we do, how the problem may be worked out to obtain the best results.

It is perfectly safe to accept the proposition that apprenticeship is to be a permanent factor as an American institution. By this is meant the new apprenticeship, involving real shop training by men who have direct responsibility for teaching trades, and have time for this work because they have nothing else to do. Trade schools unless followed by apprenticeship, do not, and I believe cannot, meet the industrial need of the times. Advocates of trade schools do not claim that complete preparation for trades may be given in such schools. The boy from the trade school needs apprenticeship for two reasons. First, to provide for his entrance into a manufacturing organization, and second, to complete his trade training. The need is so great as to justify encouragement of every possible method of providing relief. It is, however, significant that the number of authorities on this subject who believe that real apprenticeship is the only method of teaching trades, is rapidly increasing.

Let us hope that we will soon see the day when the new apprenticeship will extend to small manufacturers and to all the trades for boys and girls, and when the corporation schools will be supplanted by the public schools. Let us hope that the public schools will soon include employment officials who will say to the plumber, the mason, the carpenter and the manufacturer something like this—"I can recommend to you a fine, steady, intelligent boy thoroughly prepared to learn your trade. Will you take him as a real apprentice and teach him your trade? If not, I must find one who will do so and you may keep on with your present method, losing money through poorly trained workmen." For such boys our boards of education will sometime provide continuation schools. Until public continuation schools are provided for the apprentices of the tradesman and the manufacturer, the corporation school has an important place to fill in our educational plan.

Is the corporation school selfish and narrow? A number of the plans now in operation provide for prizes to their apprentices in the form of scholarships in engineering colleges. A plan whereby a boy may not only learn a trade but secure an education at no expense to himself and also may win a scholarship leading to a technical school diploma, is not narrow.

In a few years much has been accomplished. It is reasonable to expect that the good results which are promised with certainty to those broad-minded enough to establish these schools will lead to their multiplication. The movement was carried completely across the continent in two jumps by the New York Central and the Atchison, Topeka and Santa Fe railways. Manufacturers are not likely to be slow in adopting methods which have so abundantly proven their merit as these methods have done.

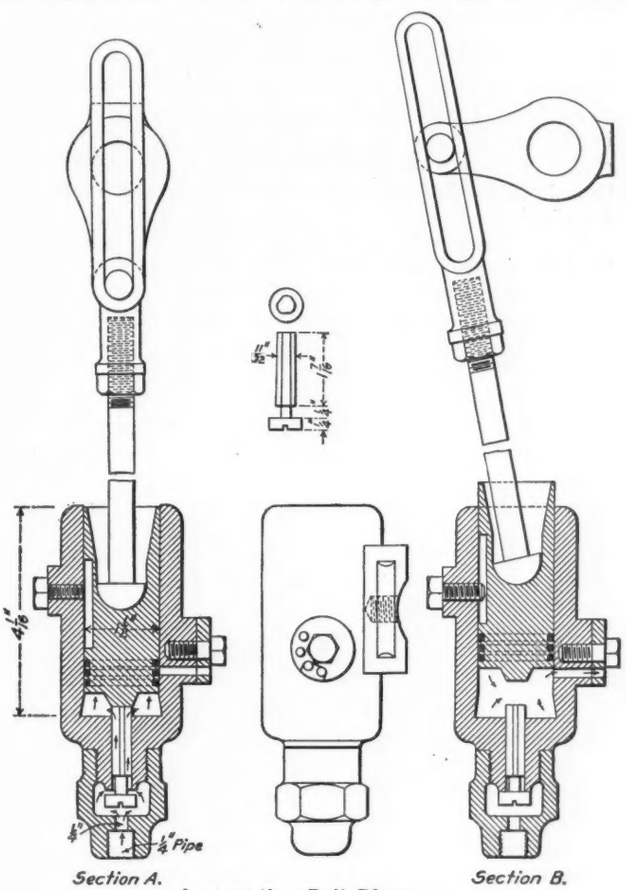
The number of employers who have undertaken the new apprenticeship is small as yet, so small as to lead to the argument that something besides apprenticeship is needed in order to meet the need for skilled workmen. The remedy is more apprenticeship. It is to be hoped that this great organization will inform itself of the true value of apprenticeship and lend its influence strongly in the direction of trade training in the shop and educational development coördinate therewith.

At the inauguration of this society, apprenticeship was referred to as a discarded, outworn system. This is not true today. The new apprenticeship has "made good" and is rapidly advancing. The society has recognized this fact in its program of this day and the influence which it might exert toward an extension of apprenticeship would be very helpful to all concerned.

Let us bear in mind that corporation schools and apprenticeship are dedicated to the proposition that trades may best be learned in the shop, that the great problem is in the shop and that the school must be taken to the boy because, unless he is fortunately situated, he cannot go away from his work to attend school. Let us also remember that many boys with the best possibilities, for one good reason or another, are obliged to leave school at an early age, and that the world today places great responsibilities upon men who have risen from the ranks of such boys.

LOCOMOTIVE BELL RINGER.

The bell ringer, illustrated, known as the Howe and Sowter, has been adopted by the Burlington, Great Northern and Northern Pacific. It is claimed to be the cheapest, simplest and best bell ringer in use, as there are so few parts to get out of order.



Locomotive Bell Ringer.

Engines on the Burlington have used these bell ringers for three years and they are about as good as when first put on. They require only a very small volume of air.

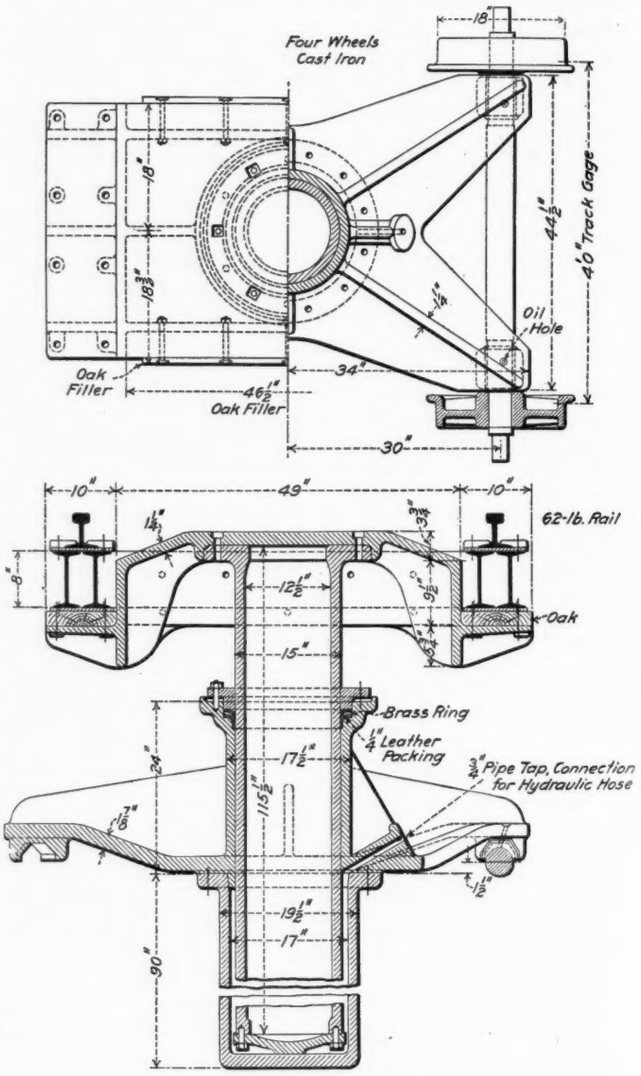
The section at A shows the bell crank passing the bottom

center, causing the piston to strike the valve and open it as shown, allowing air to pass along the flats filed on the valve stem, thus raising the piston and consequently the bell; the bell crank works in the groove in the connecting rod. The valve will remain open until the piston passes above the exhaust hole; then, pressure being released from the top of the valve, as shown by arrows on section B, the valve will close. The higher the exhaust hole the greater the pressure exerted, and if the bell is a heavy one and the bottom exhaust hole does not allow sufficient pressure, open the next one by turning round the small cap and closing the bottom one. We are indebted for the drawing and information to John Howe, draftsman at the St. Joseph, Mo., shops of the Chicago, Burlington & Quincy.

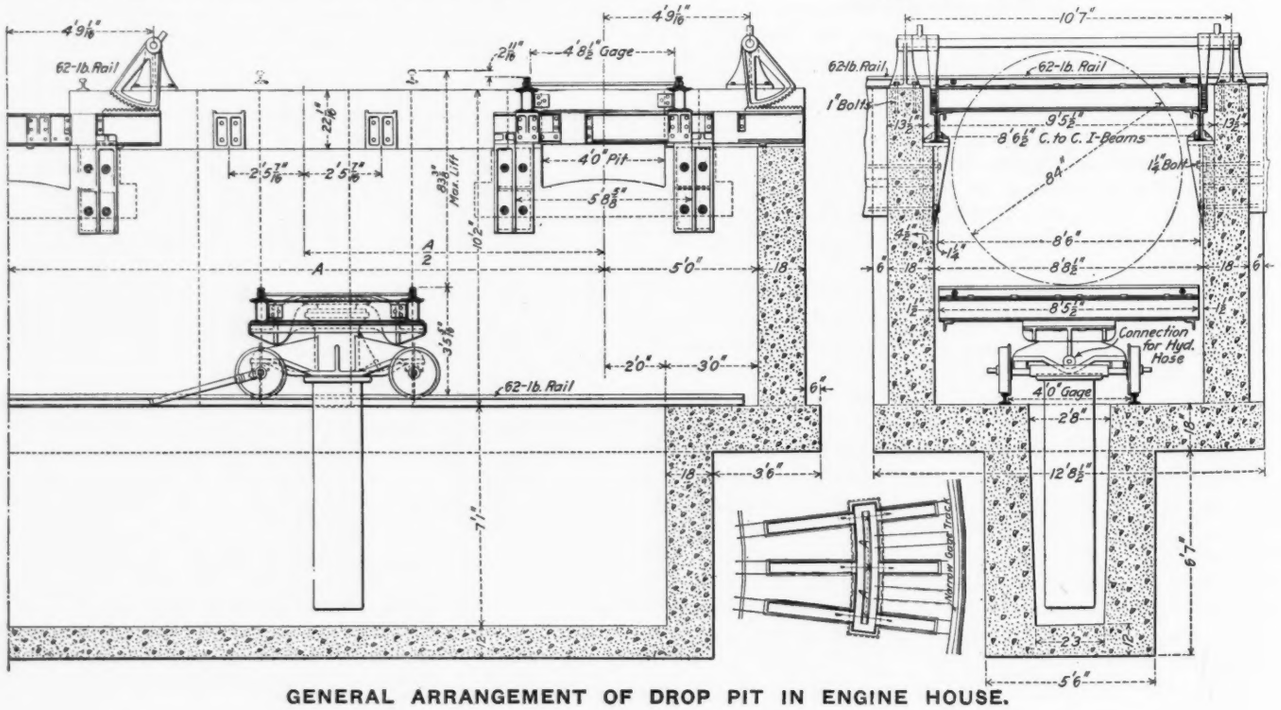
DROP PIT FOR ENGINE HOUSE.

At the Omaha, Neb., shops of the Union Pacific is a small roundhouse for storing locomotives while breaking them in and for light repairs. This building is being extended so as to be available for more light repairs to engines which would ordinarily occupy valuable room on the erecting shop tracks. Such repairs usually involve the removal of engine or tender truck wheels and driving wheels, and large drop pit jacks are provided for this purpose. The jacks are to be operated by water pressure from the shop mains at 120 lbs. A new design has been made for the drop pit and its mechanism, which includes an improved method of removing the rails and locking them. Ordinarily the rails are removed by hand or by overhead jib cranes, but with the new design the rails with their supporting beams are dropped with the wheels. They are locked in position at regular rail level by a sliding beam operated by a rack and a geared quadrant. The hydraulic piston is 15 in. in diameter, and the cylinder is supported on the pit truck by a cast iron housing in the usual way. The piston is provided at the top with a cast head 3 ft. wide, having brackets for the two 8-in. I-beams, under each supporting rail. These beams are bedded on 2-in. oak planks and are bolted to the cast head, and together with the rail are dropped with the wheels.

Along the pit walls near the top are bolted heavy cast iron brackets that are fitted with guides through which move the 12-in. I-beams that support the rail in normal position. On the outer top flange of the 12-in. beam a rack is bolted, and on the



DROP PIT JACK.



GENERAL ARRANGEMENT OF DROP PIT IN ENGINE HOUSE.

top of the pit wall are bearings for the shaft which carries the geared quadrant. The latter is operated by a lever and meshes with the rack. When it is desired to drop wheels, the large I-beams are withdrawn from contract with the wheel beams and the space is clear for the latter to drop with the wheels. In this way loose rails are kept out of the way, and the work of handling them is performed by hydraulic power. The drawings illustrate the design as worked out for large driving wheels.

APPRENTICESHIP SYSTEM OF THE LEHIGH VALLEY AT THE SAYRE SHOPS.

BY R. A. HUNT.
Apprentice Instructor.

The purpose of the apprenticeship system is to provide the motive power department with an adequate recruiting system which will eventually produce from the ranks skilled workmen, foremen and draftsmen. The general plan provides for shop instruction of the apprentices in the trades and also for their instruction in mechanical drawing, practical mathematics and shop problems during working hours and while under pay.

The shop schedule for the machinist apprentices is so arranged that shifts are made every four months and four boys are graduated at the end of every such period. The course has been carefully arranged so that the boy will have a thorough training

L. V. R. R. RECORD CARD. APPRENTICE SYSTEM. Name..... SAYRE SHOPS.

Year

Month | Class of Work | Days Worked | Rate | Workmanship | Conduct | Class Work | Class of Work | Days Worked | Rate | Workmanship | Conduct | Class Work | Class of Work | Days Worked | Rate | Workmanship | Conduct | Class Work | Class of Work | Days Worked | Rate | Workmanship | Conduct | Class Work | Workmanship marks reported by shop instructor; Basis 10 to 1 where 10 is perfect.

Conduct marks reported by shop instructor Basis A, B, C. (see below).

Class work marks reported by drawing instructor; Basis A, B, C.

Estimate of student reported by instructors (Yearly report).

A=excellent, B=good, C=fair, D=unsatisfactory, E=failure.

Total and Average

Estimate of Student

Subsequent Service

Apprenticeship Completed.....

Marks for 4 years { Workmanship..... Conduct..... Class Work.....

Apprentice's Record Card for Four Years' Course.

+Form M. P. 133—1-09-5M.

FIRST NAME | LAST NAME

PLACE OF BIRTH | DATE OF BIRTH

EMPLOYED AS	AT	DIV'N. OR ROAD	FROM	TO	REMARKS

Back of Apprentice's Record Card.

in machine and erecting work when he is graduated. The same is true for boiler maker and blacksmith apprentices. Courses are also arranged for painter and carpenter apprentices in the car department and for tinsmith, pipe fitter and tool maker apprentices in the locomotive shops.

The school room is located at a convenient distance from the main locomotive shop, far enough away to insure quiet, but near enough to insure prompt attendance. The sessions are as follows:

Monday..... 7:30 to 9:30 a. m., and 10 to 12 a. m.
Tuesday..... 7:30 to 9:30 a. m.
Wednesday..... 7:30 to 9:30 a. m.
Thursday..... 7:30 to 9:30 a. m., and 10 to 12 a. m.

Each apprentice attends two hours each week. The course deals with mechanical drawing and mathematics. The school is conducted by an apprentice instructor who instructs the apprentice in drawing, blue print reading and mathematics; he also keeps the records and sees that the apprentices are properly placed and shifted in the shop. The instruction of the apprentices in the shop is done by the shop demonstrator. The drawing room is large and airy, having two north, two east and two south windows, the entire height of room, for light and ventilation. For evening work there are numerous 32 candle power electric lights suspended from the ceiling, lighting every part of the room thoroughly.

Each boy has a complete draftsman's equipment, with the exception that first and second year apprentices are not permitted to have any inking instruments, as they do no tracing work before the third year. The room is well supplied with models of shop and locomotive parts, permitting the boy to become fully acquainted with them during his four years of apprenticeship, by sketching them and watching their operation. The school room contains a file of the best railway magazines, to which the student has access at all times. He is also permitted to examine all trade catalogues, which are turned over to the school by the shop superintendent.

The entrance examination, while not too severe for the applicant, gives an idea of the education of the boy, at the same time giving the apprentice instructor an opportunity to study him thoroughly. The boy must not be less than 16 years of age, and must have good health and good sight and hearing.

The records of each apprentice are kept by the apprentice instructor for the entire four years. The card used for this purpose is shown in the illustration. Monthly reports are received from the foreman of each department on a form showing: Workmanship, class of work, conduct, number of days worked. When the reports are received from the foreman, the apprentice instructor enters them and at the same time sends a complete report to the shop superintendent. At the end of the four years' apprenticeship each boy receives a certificate showing that he has served four years faithfully and in a manner satisfactory to the company and is competent to work at his trade as journeyman.

The discipline of apprentices is rigidly enforced as the boys are on duty in the school room as well as in the shop. Generally speaking, they are thoroughly interested in their work and the instructor has very little difficulty on account of their conduct. Some of the boys are inclined to be unruly, but with a few exceptions more can be accomplished by directing their efforts to better things rather than by punishing them.

There are many incentives to encourage the boy in his work. The drawing and problem courses are made as interesting as possible. They all deal with practical work in the shop. In the yearly report of the apprentice instructor the boys making the best showing in their work will be reported to the shop superintendent. The boys showing a liking for mechanical drawing will have an opportunity to serve with the shop draftsman for a short period before finishing their training.

The drawing course starts with geometrical drawing and advances to practical shop drawing, ending with advanced drawing work. The apprentice is not allowed to do any tracing until after his second year is completed. The making of blueprints is taught in the first year, so that a boy after he has completed his apprenticeship will be able to make his own blueprints as well as his drawings and tracings. The apprentice must be able to read a blueprint thoroughly at the end of his fourth year of

service. Strict attention is given to this branch of the drawing course, as a boy who is unable to read a blueprint makes very slow progress in his shop work. The problems deal with arithmetic applied to shop work and practical mechanics.

The shop superintendent is personally interested in all the boys and watches their advancement closely. The general foreman, as well as the department foreman, give all the aid necessary to them in their shop work. All boys are watched closely by each separate foreman, as after a boy has finished his apprenticeship he is often called to some department to do special work at the request of the foreman.

REARRANGEMENT OF MACHINE TOOLS; UNION PACIFIC LOCOMOTIVE SHOP, OMAHA, NEB.

[WITH AN INSET.]

The arrangement of the machine tools in the locomotive shop of the Union Pacific at Omaha, as here illustrated, affords a good opportunity to point out some of the advantages of the direct motor drive. This shop was built before direct connected motors were used to any extent in railway shops, and many of the belt drive tools are old. The location of tools to be driven from countershafts is often determined by the best belt arrangement rather than the best floor arrangement, and this results in the lathes being staggered back to back, planers crosswise, and other tools out of line, so that the main aisles for delivering material to the machines are broken up and made very indirect. In purchasing a number of new machine tools for the Omaha shop, it was determined to order most of them, even the rather small ones, with direct motor drives. In placing them in the shop advantage was taken of the fact that the location was independent of belt requirements.

The erecting shop, which is in the same building, has three longitudinal tracks with a pit capacity for 20 locomotives; the normal capacity of the shop is 24 engines per month with general repairs—30 per cent. of them with new fireboxes. Including light repairs, over 300 locomotives are turned out per year; the tool equipment here shown is comparatively small for such an output.

The rearrangement of the tools was done under the direction of G. J. Hatz, superintendent of the Omaha shops. Although the shop was apparently full of tools when the large new equipment was bought, by the removal of a few old ones and the symmetrical location of the new ones, it was possible to find ample room for the new tools and obtain some open spaces for future additions. Two avenues are provided for delivering material to the machine tools by track—the wide gage track to the right of the center, which extends to a casting platform at the storehouse, and the narrow gage transverse track, which also connects with the storehouse platform. The cylinder planer and boring mill are placed at one end of the shop alongside the castings track, and the boring mill for tires and centers is opposite. These tools finish the principal heavy pieces. The 60-in. frame planer is located along this aisle and also two radial drills, which are placed so they can both operate on a frame at the same time. The frame slotter is on the opposite side of the aisle between the planer and the drill presses. The track to the left of the center was found unnecessary and has been removed; the space is available for the storage of material and for an open aisle.

The two driving wheel lathes are seen in the extreme opposite corner. One of these is a modern lathe driven by a 50 h. p. motor and the other, an older and lighter machine, is driven by a 22 h. p. motor. The latter is used principally for turning driving journals. It will be seen, therefore, that this large shop is able to take care of all tire turning, tire boring and wheel center turning with one wheel lathe and one boring mill. Piston heads and cylinder heads are turned on two 54-in. vertical boring mills, and directly back of them is the lathe for turning piston rods; a jib crane connects this lathe with the 100-in. Norton grinder. The lighter machinery for cylinder packing, throttle and reverse levers is placed near the wall and close to the iron benches where this work is finished. Driving boxes are delivered on the transverse narrow gage track to the 24-in. slotter, and they are planed and drilled and the bearings bored in the driving box section. Opposite the latter is a group of tools for finishing the link motion, and farther on are benches for the hand work on these pieces. The rod gang is located around the locker room, and the machine tools required for this work are near at hand.

We have mentioned the tools required for the principal operations. There is a traveling crane traversing the whole length of the middle section, and the heavier tools have been placed within its reach. It will be noticed that nearly all the tools are arranged in straight lines with ample spaces at the ends, and there are free avenues not only at the sides of the tools, but at their ends; this is especially true of the lighter tools that are not within reach of the traveling crane. Convenient access to all tools has here received special emphasis, and for this reason the plan will be worth the careful study of those interested in locating machines in locomotive machine shops.

EXPOSITION OF SAFETY DEVICES.

Fifty per cent. of the accidents in American industries are preventable, is the claim of the American Museum of Safety. In proof of this, it has just opened a permanent exposition of safety devices in the Engineering Societies building, New York, to show how the dangerous parts of the machines and processes may be protected so as to save the lives and limbs of the workmen. It thus becomes a clearing house for every worthy device and every worthy thought concerning safety. It is its purpose to place this new museum idea on the highest plane; namely, the realization of the greatest ideal regarding conservation—the conservation of human life.

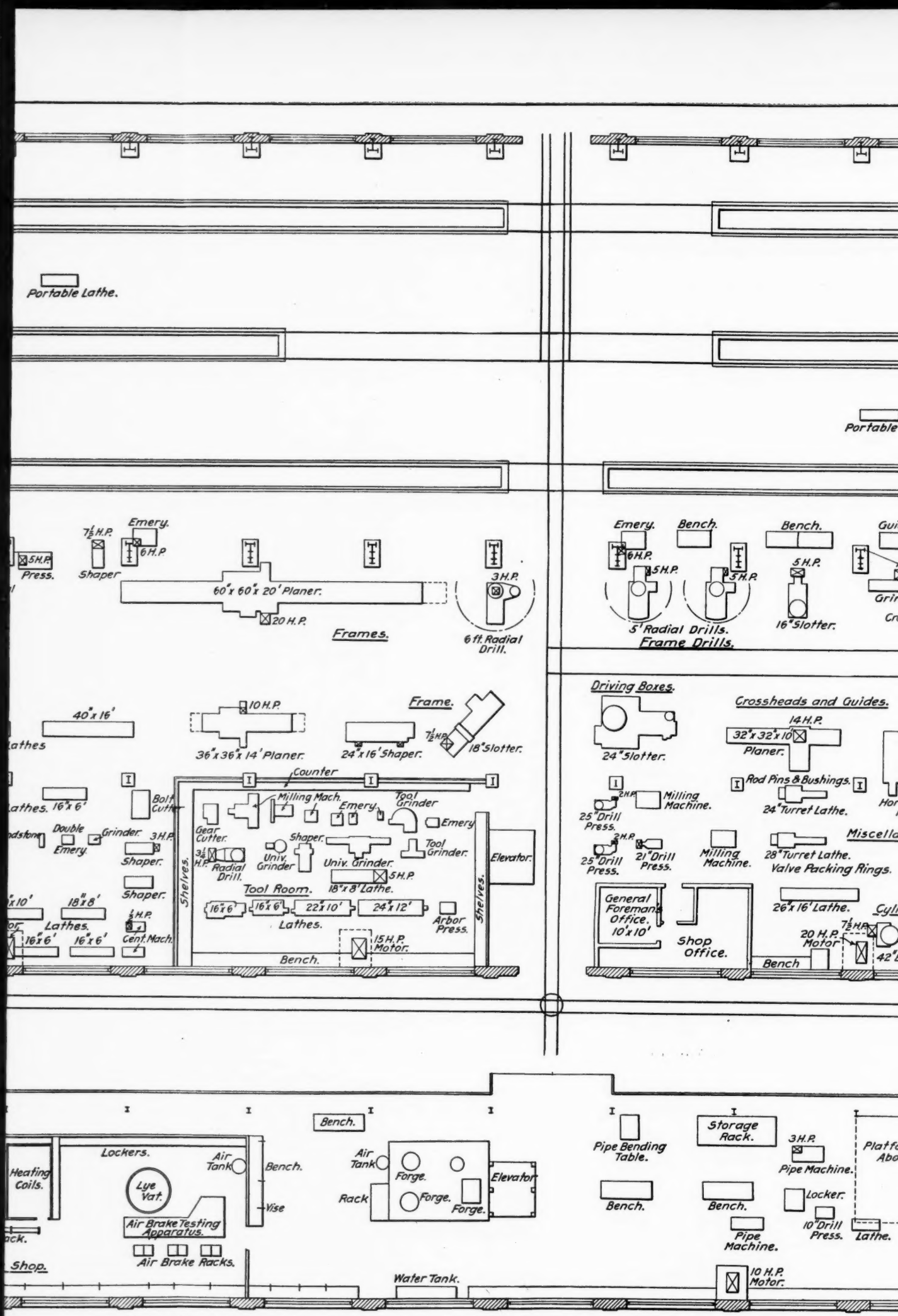
The exposition consists of machines in actual operation, models and photographs of safety devices for circular saws and planers, presses and grinding machines; safety exit doors and fire escapes; respirators and helmets for supplying pure air; elevators, safety lamps, and containers for gasoline and other volatile liquids. The building trades, textile industry, transportation, quarrying, the chemical industries and wood-working contain their appropriate safeguards.

At the formal opening of the exposition on November 21, S. C. Dunham, president of the Travelers Insurance Company, presented a gold medal to the United States Steel Corporation as the industrial institution whose management had done most during the past year to conserve human life and prevent accidents. A medal is offered by the *Scientific American* for the best safety device exhibited during the forthcoming year.

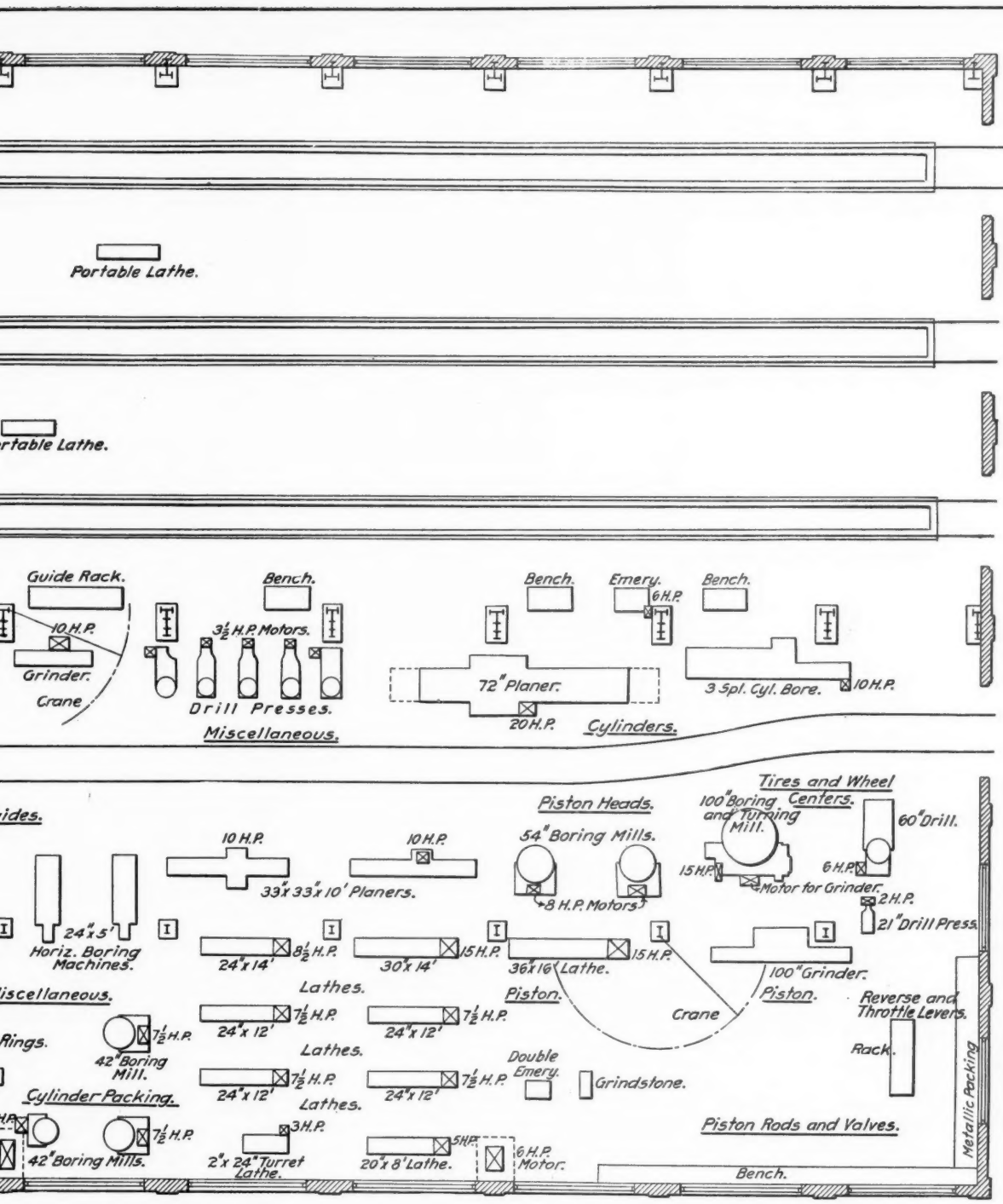
ARGENTINE RAILWAY BUILDING.

The Buenos Aires Western has been granted a concession for building a section of line, 45½ miles, from La Zanja to Meridiano V. The Buenos Aires Great Southern has been given permission to build and operate a line, either single or double track, to connect its system with the Buenos Aires harbor lines. Work must be commenced within six months after the approval of the plans, and be completed within two years thereafter. A concession has been granted to Señor Damian M. Torino for the building and operating of a railway from Rufino, in the province of Santa Fe, via Pegasano and Nacuñan, to San Rafael, in the province of Mendoza. Work must be begun within six months after the approval of the plans, and completed within three years thereafter.

ARRANGEMENT OF MACHINE TOOLS



ARRANGEMENT OF MACHINE TOOLS IN THE UNION PACIFIC LOCOMOTIVE SHOPS AT OMAHA, NEB.


Portable Lathe.
rtable Lathe.
Guide Rack.
10 H.P.
Grinder.
Crane
Bench.
3½ H.P. Motors.
Drill Presses.
Miscellaneous.
Bench.
Emery.
6 H.P.
Bench.
72" Planer.
20 H.P.
Cylinders.
3 Spl. Cyl. Bore.
10 H.P.
ides.
10 H.P.
39" x 33" x 10' Planers.
10 H.P.
Piston Heads.
54" Boring Mills.
8 H.P. Motors.
100" Boring and Turning Mill.
Centers.
Tires and Wheel
60" Drill.
15 H.P.
6 H.P.
Motor for Grinder.
2 H.P.
21" Drill Press.
24" x 5'
Horiz. Boring Machines.
24" x 14'
8½ H.P.
30" x 14'
15 H.P.
36" x 16' Lathe.
15 H.P.
100" Grinder.
iscellaneous.
Lathes.
Piston.
Crane
Piston.
Reverse and Throttle Levers.
Rings.
7½ H.P.
24" x 12'
7½ H.P.
24" x 12'
42" Boring Mill.
Lathes.
Rack.
Double Emery.
Grindstone.
Cylinder Packing.
24" x 12'
7½ H.P.
24" x 12'
7½ H.P.
Lathes.
7½ H.P.
42" Boring Mills.
3 H.P.
2" x 24" Turret Lathe.
5 H.P.
20" x 8' Lathe.
6 H.P. Motor.
Piston Rods and Valves.
Metallic Packing
Bench.
Platform Above
Heating Coils.
Fan.
Engine
Storage Rack.
Storage Platform Above
Bench.
8 H. Brake
Bench.
Bench.
Bench.
Shears.
Rolls.
Shears.
Rolls.
Rack.
Bench.
Bench.
Shears.
3 H.P.
Press.
Air Press.
Bench.
Shears.
Electrical Shop.
Lathe.
Tin Shop.
Bench.
Foreman's Office.

B.

General News Section.

On the Pennsylvania Railroad telephone operators now have the same rights and privileges as telegraph operators.

The New York State Sealer of Weights and Measures is testing the track scales at railway stations throughout the state. The New York Central requested that these tests be made, and provided for the sealer a special car.

The Postmaster-General, in his annual report, soon to be issued, will recommend the establishment of a limited parcels post on the rural free delivery routes. He proposes that the limit of weight shall be 11 lbs., which is the same as that which prevails in international mails.

On December 1 the Chesapeake & Ohio Railway Company of Indiana, formerly the Chicago, Cincinnati & Louisville, began running its trains over the track of the Chicago & West Indiana from Hammond, Ind., to the Dearborn street station in Chicago. It is also using suburban stations at Forty-seventh and Sixty-third streets in Chicago. At the same time the differential of $1 between the passenger rate of this road and other roads between Cincinnati and Chicago was abolished, its rate being raised to the regular $6 basis.

"The Erie Roll of Honor," which appears in the November number of the *Erie Railroad Employees' Magazine*, contains the names of a flagman, two telegraphers, a section foreman, a yard conductor and a pumper who have lately received letters of commendation from their superintendents for vigilance in discovering things out of order. The section foreman, O. Smith, is commended for "making diligent inquiry" of an engineman as to whether he had passed over any rough spots in the track and for promptly attending to those rough spots when they were disclosed.

The New York Central & Hudson River has bought for $1,350,000 the real estate of the Hospital at the corner of Forty-second street and Lexington avenue, New York City, thus completing its purchase of practically all the real estate between Madison and Lexington avenues, from Forty-second street north to Fiftieth street, and making of the Grand Central Terminal a symmetrical plot. Some of the buildings on this plot will stand, however, for a number of years, the land not being required for those parts of the new station which are included in the present plans.

The Illinois Central, which for some time has had telephones in use for train despatching on more than 2,000 miles of its road, has lately established such a circuit between Paducah, Ky., and Central City, 99 miles, with 37 stations, at 16 of which are no telephones. These 16 stations are mostly booths at side tracks where there is no agent. The booths are fitted up with all suitable connections, but the telephones are carried by the freight train conductors in their cabooses. A telephone is delivered to each conductor as he begins his run and he signs a receipt for it; and at the end of the run he returns it to the proper officer. To make a connection at a side track station he simply has to insert a plug into a jack in the booth.

Frank B. Harriman, formerly general manager of the Illinois Central; Charles L. Ewing, formerly general superintendent; John M. Taylor, formerly general storekeeper, and Joseph E. Buker, formerly superintendent of the car department, were indicted by a grand jury at Chicago on November 25 on a charge of fraud in connection with the repair of cars belonging to this road. Harriman, Ewing and Taylor gave bonds for $10,000 each. Buker is believed to be in Canada, and a capias was issued for his arrest. The indictment charges the defendants with conspiracy, and names December 10, 1909, as the date on which the conspiracy was formed. The indictment names the Ostermann Manufacturing Company, the Blue Island Car & Equipment Company, and the Memphis Car Company as concerns with whose coöperation the frauds were committed. The total amount of the frauds is estimated at $1,500,000, and the amount of business given to the companies named is stated to have been $4,825,650.

The Southern Pacific is building at its shops in Sacramento two lunch-counter cars, designed to be used on passenger trains, with a view to giving all of the passengers on a train more democratic facilities for satisfying hunger while on the road than are afforded by the ordinary dining car or cafe cars. The car will have a kitchen, though in most respects it will be more like a lunch counter than a regular dining-room; but instead of high revolving stools the car will be fitted with high-back revolving chairs. In connection with the announcement of these cars the reporter gathers that the Southern Pacific at present feeds 14,000 people a day on its dining cars and at its hotels. The number of meals served in the dining cars in a year is 2,750,000; on the steamers of the company, 1,100,000; and at station restaurants, 1,000,000. The average receipts per meal are about 65 cents on dining cars and about 30 cents on steamers and at stations. The number of employees in this department is 1,200. The annual expenses amount to $1,000,000 for supplies; $600,000 for wages and $500,000 for other expenses, including $12,000 a year for the flowers with which to decorate the tables of the dining cars.

Corporation Records in Washington.

The Treasury Department at Washington has issued a circular, approved by President Taft, prescribing the rules to be followed in giving out information which has been sent to the Treasury by corporations in connection with the payment of the annual corporation tax. If any other departments of the government desire information of this kind, as for use in legal proceedings, the application for permission to inspect must be referred to the Attorney-General. A shareholder may see the returns of his corporation upon application in writing, giving his reasons, and proving that he is a shareholder. Any person, on making written application and giving suitable reasons, may see the returns of all corporations whose stock is listed on duly organized stock exchanges in this country, and all corporations whose stock is advertised or offered to the public by the corporation itself for sale. Returns can only be seen in the office of the Commissioner of Internal Revenue, at Washington, and the applicant must appear in person. No copies of returns will be furnished except to the corporation making them.

An Argument for Government Ownership?

The following newspaper despatches, turning up so nearly simultaneously, are worth considering together:

"WASHINGTON, Nov. 21.— * * * Louis D. Brandeis, counsel for the traffic committee of the national association of the Atlantic seaboard, outlined the case of the shippers. * * *. 'We shall show you how scientific management, when applied to the simple operation of loading a railway car with pig iron, increased the performance of the individual worker from 12½ to 47 tons * * *. Besides economies from the introduction of scientific management, there are, as we shall show you, other economies possible in railway operation, attainable under the present system of management by the introduction of new devices like the substitution of machines for hand labor. For instance, for comparatively small capital expenditures, large economies are believed to be possible through the use of appropriate machinery in the handling of freight, in loading and unloading, warehousing and accounting; thus not only reducing the terminal expense, but overcoming the congestion of the terminals.'"—*New York Eveing Post.*

"WASHINGTON, Nov. 22.—Unionism exacts an annual tribute of $778,000 from one bureau alone of the United States government. Each year this large sum is contributed from the federal treasury to the union plate printers employed in the bureau of engraving and printing. This $778,000 represents the amount that would be saved annually by the federal government if power presses were introduced into the bureau in place of the old hand roller presses now used in turning out bonds, notes and checks. An act of Congress passed in 1898 at the instance of union labor has prevented the introduction of this economy. The total plate printers have been adroit in the methods they have adopted to entrench themselves in Congress.

They have sent speakers out to aid members of the house of representatives in Congress and on several occasions have presented to influential members of both the house and the senate beautifully engrossed resolutions certifying that said member or senator was a friend of union labor."—*New York Sun*, Nov. 23.

Standard Height of Drawbars.

The Interstate Commerce Commission in accordance with an act of Congress of April 14, 1910, whereby it was authorized to modify or change and to prescribe the standard height of drawbars and to fix the time within which such modification or change shall become effective and obligatory, has ordered: That (except on cars specified in the proviso in section 6 of the Safety Appliance Act of March 2, 1893, as the same was amended April 1, 1896), the standard height of drawbars heretofore designated in compliance with law is hereby modified and changed in the manner hereinafter prescribed—to wit: The maximum height of drawbars for freight cars measured perpendicularly from the level of the tops of rails to the centers of drawbars for standard-gage railways in the United States subject to said act shall be 34½ in., and the minimum height of drawbars for freight cars on such standard-gage railways measured in the same manner shall be 31½ in., and on narrow-gage railways in the United States subject to said act the maximum height of drawbars for freight cars measured from the level of the tops of rails to the centers of drawbars shall be 26 in., and the minimum height of drawbars for freight cars on such narrow-gage railways measured in the same manner shall be 23 in., and on 2-foot gage railways in the United States subject to said act the maximum height of drawbars for freight cars measured from the level of the tops of rails to the centers of drawbars shall be 17½ in., and the minimum height of drawbars for freight cars on such 2-foot gage railways measured in the same manner shall be 14½ in. Such modification or change shall become effective and obligatory December 31, 1910.

New Passenger Station for the Milwaukee Road at Missoula.

An officer of the Chicago, Milwaukee & Puget Sound furnishes the following description of the new passenger station at Missoula, Mont., now under construction by that company:

The station consists of two detached buildings; a main building 44 ft. by 94 ft., two stories high; and a baggage and express annex 28 ft. by 76 ft., one story high. The first floor of the main building contains a large general waiting room, smoking room, ticket office, women's rest room, men's and women's toilet rooms, tower entrance vestibule, and rear hall and stairway leading to the second floor. The second floor will contain offices for the division superintendent, superintendent's clerks, trainmaster, roadmatser, telegraph and telephone department, division engineer, bridge and building department, division freight and passenger agents, store room for records, and toilets. The baggage and express annex, in addition to ample baggage and express rooms, contains a battery room and the steam heating plant.

The exterior presents a pleasing appearance with its two towers as a mark of special distinction. The color scheme of the exterior has been taken care of by selecting such materials as will produce desirable contrasts in the buildings themselves and with their surroundings. The base to a height of 5 ft. above the platform is of reinforced concrete, which harmonizes with the heavy belt courses and other stone trimmings, all of which are of buff Bedford stone. Above the base the exterior walls are of mottled cream colored pressed brick and the roofs of red Spanish tile. The cornice overhang is just enough to well protect but not dwarf the appearance of the buildings.

The first floor of the main building is of reinforced concrete construction, finished with Akron red and black tile, laid with wide joints of black cement mortar. The waiting rooms will have beamed ceilings and high paneled wooden wainscoting. All interior trim will be of fir, neatly moulded and stained mission finish, with hardwood settees, etc., to harmonize. The lighting will include both gas and electricity, so arranged that a maximum, minimum or intermediate amount of light can be had for all rooms of the first story. There will be both combination and ceiling light fixtures controlled by switches. The exterior lights placed on under side of cornice brackets are intended for platform lighting and are controlled by switches from the ticket office. The building was designed by the bridge and building department of the company, C. F. Loweth, engineer and superintendent bridges and buildings, and J. A. Lindstrand, architect. The work is being done under contract by Olson & Johnson, contractors, Missoula, Mont.

Investment as Distinct from Speculation.

About 99 per cent. of the shareholders who received their dividends on Pennsylvania Railroad stock on Wednesday have filed permanent dividend orders with the railway. The total number of shareholders of the Pennsylvania Railroad on November 5 was 64,869, and all but 617 of these have filed their permanent dividend orders with the company.

Hearings by the Hadley Commission.

The commission to investigate questions pertaining to the issuance of stocks and bonds by railways, which was appointed by the president in accordance with section 16 of the Mann-Elkins law of last June, and of which Dr. Arthur T. Hadley is chairman, held its first public hearing in Washington on Monday of this week. The first day's session was devoted wholly to hearing the views of Interstate Commerce Commissioner Clements. Mr. Clements said that the Interstate Commerce Commission was on record as favoring a physical valuation of railways and federal control of stock and bond issues of interstate carriers, but no plan for valuation had been worked out; such a valuation would be a formidable task. He called attention to the fact that physical valuation alone would not be a proper basis for rate making. The bill presented in Congress last winter contained a provision prohibiting railways from selling their stocks and bonds below par. This was one of the things that killed the bill. Sales below par are made to induce investment in speculative construction, but Mr. Clements thought that the period of speculative railway building was past. Except in the far West there is no speculative railway construction now going on. He denounced stock bonuses as vicious; but railways ought to be allowed to issue bonds to pay for betterments and to settle debts. In a law to control the issue of securities it would be fair to make a difference between old roads and new roads. The witness thought that a national incorporation law would be useless unless it could be made compulsory. Without uniformity there can be no complete regulation. Capitalization abuses cannot be corrected by publicity alone, for as a rule publicity does not come until after the abuse has been consummated.

On Tuesday the commission listened to W. P. Hall, chairman of the Massachusetts Railroad Commission, and to James F. Jackson, former chairman of the same commission. Mr. Jackson thinks it would be a mistake for the federal government to regulate the issuance of stocks and bonds as strictly as was done by the former Massachusetts law. Mr. Hall thought that the law should permit the issue of securities at less than par or else recognize higher dividends. Where stock is sold at less than par the price might be stamped on the question if a reasonable return is a local one. What is considered a fair dividend in Arizona would be unduly high in Massachusetts.

Chairman Hadley asked if the electrification of existing railways could be considered speculative building, justifying the issue of securities at less than par. Mr. Hall did not think so. He said that such improvements and the building of terminals, like the Pennsylvania station in New York, gave benefits to the public justifying a slight increase in rates, if necessary.

J. J. Hill on the Outlook.

That the United States—and the world, in fact—will soon harvest the fruit of extravagance, J. J. Hill is absolutely positive. The country faces no panic and matters will finally adjust themselves; but the American people are too complacent. They spend too freely and are greatly inclined to take a rosy view of things entirely unwarranted by circumstances.

"Extravagance has been our great fault. We have been wasting entirely too much in non-productive undertakings. As a rule we have been given too much to adornments. We have become obsessed with 'the city beautiful' in municipal affairs. We have followed like policies in the state and national governments. Battleships, not only in this country, but also abroad,

are illustrations of the extravagance in which the world has been plunged for the last two decades. The money for the construction of these has been withdrawn from commercial circles and almost as good as squandered so far as any tangible returns can be observed.

"If a man buys a farm and cultivates it, he contributes to the material wealth of society. If he permits the land to lie idle he has subtracted from the general wealth by withdrawing his money from commerce and investing it in a non-profitable enterprise. This illustration serves to indicate our trend in all departments of our government.

"Do you hear of any generally systematic plans for improvements during the next year? There is none. Factories and such other enterprises which are productive in their nature and which contribute to wealth are not contemplated by those who have the money to invest. This means that those who have nothing to sell but their time will be without employment. There will have to be shutting down of the mines because iron and coal and other minerals that go into production of commercial articles will not be in demand. The same might be said about the lumber business and other forms of activity.

"In preparing our Great Northern orders for next year we find that we are going to need very few supplies. This is because we are making no extensions. Last year we ordered 245,000 tons of rails and had no surplus. For the next year we will need only about 70,000 tons. Last year we had to have 11,000 new freight cars; this year we shall need but 3,000. Last year a large number of passenger coaches; this year we shall need none. We ordered over 300 locomotives last year; twenty new ones will be an abundance for next season."—*Newspaper Interview.*

A Very Unusual News Item.

Following out its policy adopted a year ago of sharing the benefits of increased business with employees, the Brooklyn Rapid Transit Company has voluntarily increased the wages of all motormen, conductors and guards employed on its elevated and surface lines, by sums equal to 5 per cent. The increase becomes effective January 1, and will add about $300,000 to the year's payroll. The higher wages will be 10 per cent. above the level of January 1, 1910, a general increase having been made on April 1 last.

The new scale is based in part on the employees' period of continuous service with the company. This system has been found to be very successful in securing loyalty to the company. The increase affects more than 4,000 men, most of whom received advances last year. The general manager says that the increases were made without any demands from the men, and that there was no hint of dissatisfaction with the old scale. There is no union among these employees, and the company has followed the policy of giving its men higher wages as rapidly as increased travel justified them. Futile efforts have been made at various times by special organizers to build up a union in Brooklyn, but the men have steadfastly refused to be organized.

Pennsylvania Station in New York.

The new station of the Pennsylvania Railroad in New York City was opened for general business last Sunday, according to announcement, the express trains to and from the West and South beginning to use the station at 12:02 a. m. A part of the station had been in use by the trains of the Long Island for about two months. On the opening day about 100,000 people visited the station simply as sight-seers. These, according to a morning paper, came en masse to gape at this fresh mechanical miracle. "In thousands they flooded the acres of its floor space, gazed like awestruck pigmies at the vaulted ceilings far above them, inspected curiously the tiny details of the place, so beautifully finished, on their own level, and pressed like caged creatures against the grill which looked down upon subterranean tracks, trains and platforms. W. W. Egan, the station master, was of the opinion that some of them had been there all night. There was no let up all day.

"Aside from its colossal dimensions and great distances, the most noteworthy feature of this human achievement is its silence. It's too big to be noisy, too dignified in its spaciousness for staccato sounds. The steady hum of its tense life spells only peace, like the drone of bees in a summer garden. The stealthy trains circulate in its underworld unnoticed. Even the announcers' calls fade into faraway song, echoing in a canyon.

"The hordes of sightseers caused no indigestion in the huge maw of this monster. Passengers came and went or waited without inconvenience or crowding, though they were outnumbered fifty to one by the sightseers. * * * Some delays occurred in the early morning, but as the day wore on and the shifting crews became more familiar with their duties the time table was adhered to much more closely. In the afternoon the only appreciable delay was the case of the Southern Railway Express, due to leave at 4:38. For three-quarters of an hour after the time set no cars appeared on the track, but the wonders of the place engaged the attention of the passengers and they discussed them quietly with one another or with the red-capped porters presiding over their hand baggage, forgetting to complain."

Views of the interior of this station were published in the *Railway Age Gazette* April 15 last, page 998, and other descriptive articles have been given as follows: February 9 and May 25, 1906, floor plans and architect's perspectives; August 20, 1909, page 328, exterior view of the completed building.

Following the announcement by the Pennsylvania of a complete hourly express train service between New York and Philadelphia which met, and more than met, the hourly schedules of the Central of New Jersey-Philadelphia & Reading line, which have been in effect for several years past, the Central announced that all of its two-hour trains between these cities would be quickened to run through in one hour and fifty minutes; and additional trains were put on also, making the service about the same in frequency as that of the Pennsylvania. The announcement calls attention to the fact that for Philadelphia passengers the Central is the only line having a downtown station in New York. It appears, however, that the Pennsylvania continues to run a few Philadelphia expresses to and from the old terminus at Jersey City—two eastward in the morning and three westward at night. These trains have connections at Manhattan Transfer to or from the Thirty-second street station.

Under the new schedules Central-Reading expresses run from Jersey City to Philadelphia and vice versa in 96 minutes, equal to 56.25 miles an hour.

The franchise from the City of New York authorizing the Pennsylvania tunnels and station was granted October 9, 1902, and the first work was begun on June 10, 1903. Work on the station was started May 1, 1904, so that practically six years and seven months were consumed in making the excavations for the foundations of the building and in constructing it. To clear the eight acres of ground occupied by the station meant the razing of some five hundred buildings, among which were a number of churches. The stone work of the station was completed on July 31, 1909. A total of 550,000 cubic feet of "Milford pink granite" have been utilized in the construction and ornamentation of the building.

In connection with the opening of this station and the transfer of a large part of the Pennsylvania's passenger car storage and cleaning to Sunnyside, east of Long Island City, about 400 families of employees of the company are moving from Jersey City to the Borough of Queens.

Good Roads Association.

The American Association of Highway Improvement was organized at Washington, D. C., November 22, and permanent headquarters will be established in that city. The officers are L. W. Page, director of the United States bureau of public roads, president; W. C. Brown, president of the New York Central, vice-president; Lee McClung, treasurer of the United States, treasurer, and J. R. Pennypacker, secretary. The board of directors includes L. W. Hill, president of the Great Northern, chairman; James McCrea, president of the Pennsylvania; W. W. Finley, president of the Southern; B. F. Yoakum of the St. Louis & San Francisco; L. W. Page and A. G. Spaulding.

The American Society of Mechanical Engineers.

The thirty-second annual meeting of the society will be held in the Engineering Societies Building, New York, beginning Tuesday evening, December 6, which will be the occasion of the annual presidential address, and of a reception by the president and the president-elect. The professional papers to be presented are unusual in variety and

merit. On Wednesday morning, following the transaction of business, an account of the joint meeting in England will be given by the secretary, Calvin W. Rice; and there will also be a paper by George A. Orrok of the New York Edison Company, on the transmission of heat in surface condensation. On Wednesday afternoon a session on steam engineering will be held, with a paper on carbon dioxide as an index to combustion, by E. A. Uehling of the Uehling Instrument Company; two accounts of tests on steam turbines in the locality of San Francisco, one by S. L. Naphtaly of the City Electric Company, and the other by F. H. Varney of the Pacific Gas & Electric Company. Other related topics will also be presented. The reception by the local membership will be held on Wednesday evening instead of Thursday evening, as heretofore.

On Thursday there will be three sessions: one in the morning upon miscellaneous topics; and in the afternoon two simultaneous sessions, a machine shop meeting devoted to the subject of grinding, with papers by C. H. Norton of the Norton Grinding Company, W. A. Viall of the Brown & Sharpe Manufacturing Company, and B. M. W. Hanson of the Pratt & Whitney Company; and the meeting of the gas power section, beginning with a paper by E. P. Coleman upon the blast-furnace gas-power installation of the Lackawanna Steel Company. On Thursday evening there will be an address by Dr. Georg Kerschensteiner, superintendent of schools in Munich, on the industrial continuation schools of Munich. Dr. Kerschensteiner has been foremost among educators in Europe in bringing industrial establishments into co-operative relations with the public school system. So much importance is attached to this address that it is proposed to make the session a joint meeting with the National Society for the Promotion of Industrial Education, the American Institute of Mining Engineers and the American Institute of Electrical Engineers. Dr. Kerschensteiner is a brilliant lecturer, and the opportunity for hearing so distinguished an educator is exceptional. Friday will be devoted to excursions to points of engineering interest, thus making it possible for the out-of-town members to become more familiar with New York, as well as concluding the meeting in an informal way which should give opportunity for increased acquaintanceship in the society.

Canadian Society of Civil Engineers.

At a meeting of the mining section, held November 24 in Montreal, a lecture on "'Railway Construction and Tropical Experiences in the Gold Mines of Ashanti, West Africa," illustrated with lantern slides, was given by Hilder Daw.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911; Niagara Falls, N. Y.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., 1911.

AMERICAN ASSOCIATION OF LOCAL FREIGHT AGENTS' ASSOCIATION.—G. W. Dennison, Pennsylvania Co., Toledo, Ohio.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew building, Cincinnati, Ohio.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Sept. 17-19, 1911; St. Louis, Mo.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION.—E. H. Fritch, Monadnock building, Chicago; March 21-23, 1911, Chicago.

AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 6, 1911; Detroit, Mich.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.

AMERICAN ROADBUILDERS' ASSOCIATION.—Dec. 6-9; Indianapolis, Ind.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wednesdays, except July and August; annual, Jan. 18-19, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., New York; annual, Dec. 6-9; New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—G. B. Colegrove, I. C. R.R., Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston, Mass.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Place, New York; Dec. 13-14, 1910, Chicago; June 20-21, 1911, Cape May City, N. J.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays; Montreal, annual, last week January.

CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul; 2d Monday, except June, July and Aug.; St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday; annual, Jan. 17, 1911; Pittsburgh.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot R.R., Richmond, Va.; 20th annual, June 21, 1911; St. Paul, Minn.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—H. D. Judson, 209 East Adams St., Chicago; Wednesday preceding 3d Thursday; Chicago.

INDIANAPOLIS RAILWAY AND MECHANICAL CLUB.—B. S. Downey, C., H. & D., Indianapolis, Ind.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911; Chattanooga, Tenn.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.

INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., except June, July, August; alternately at St. Paul and Minneapolis, Minn.

NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P.; 4th Saturday; Duluth, Minn.

OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; second Wed.

RAILWAY CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City; 3d Friday in month; Kansas City.

RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May, 1911.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911; St. Louis.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Prudential bldg., Atlanta, Ga.; 3d Thurs.; Jan., April, August and Nov.; Atlanta.

TOLEDO TRANSPORTATION CLUB.—L. G. Macomber, Woolson Spice Co., Toledo; 1st Sat.; annual, May 6, 1911; Toledo.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 13, 1910; Buffalo, N. Y.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.

TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly; Pittsburgh.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore, Md.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August; Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, First National Bank bldg., Chicago; annual, Jan. 17-19, 1911; Chicago.

Traffic News.

On Sunday last the Ohio river at Pittsburgh was high enough to float coal boats, for the first time in five months, and boats carrying about four million bushels were started down the river; also several thousand tons of iron and steel products.

At a recent meeting in St. Louis, Mo., of passenger officers of the lines entering St. Louis a report was received from the committee appointed to investigate the desirability and feasibility of establishing a joint down-town ticket office. The committee favored the plan and mentioned four possible locations. It was decided, however, to make further inquiries regarding a proper location, and the matter will be reported on at a meeting on the second Monday in December.

The Transportation Club of Cincinnati is to be rejuvenated. A lease has been taken on the fifth floor of the Harrison building in the central business district, and a committee of 26 will furnish the rooms and make a program for the year that, it is expected, will attract the leading transportation men. The following committee will have general charge of the campaign for new members: C. V. Shinkle, chairman; C. L. Netherland, J. H. Bunker, Walter G. Remelin, William Fallon and F. H. Talbot.

The Trans-Mississippi Commercial Congress, which met at San Antonio, Tex., on November 23, adopted resolutions favoring valuation of railways, the prescription by the Interstate Commerce Commission of rates to gulf ports on the basis of distance, the enactment of a law by Congress to regulate the issuance of stocks and bonds by railways "without intrenching on the rights of States to regulate their corporate affairs," the enforcement by the President of the anti-trust laws against rail and water carriers as well as other offending corporations, and the infliction of the penalty of imprisonment as a remedy for violations of the anti-trust law.

A conference between the Interstate Commerce Commission and attorneys representing a number of railways took place at Washington Nov. 28, The first question discussed was whether the long and short haul clause as amended should be applied to import and export business: Whether it in effect prevents the carrier charging less for the haul from the seaboard to the interior destination on business coming from a foreign country than it charges on the same commodity from the interior bound to the same destination, the commodity being of domestic origin. George Stuart Patterson of the Pennsylvania Railroad and representing the carriers generally contended that the law did not apply to import and export rates. He relied largely on the history of the law itself and constructions of the Interstate Commerce Commission. In referring to the history of the law he quoted extensively from debates in Congress delivered at the time of its passage. F. H. Wood, of the St. Louis & San Francisco supported Mr. Patterson in his view of the case. E. C. Lindley of the Great Northern and F. C. Dillard of the Southern Pacific and the Union Pacific lines disagreed with Mr. Patterson, these attorneys contending that the law did apply to import and export rates. Mr. Wood discussed that phase of the law relating to the absorption of switching charges by the carrier on business from competitive points while refusing to absorb switching charges on business from non-competitive points. He contended that such practice did not constitute a violation of the long and short haul clause. R. Walton Moore, special counsel of railways in the southeast, closed the discussion by saying that at first advised concerning the effect of the long and short haul law he was confident that it was not applicable to export and import business, but as the discussion of the subject had progressed he had been thrown into complete bewilderment as to what the proper construction of the law should be.

Representatives of transcontinental lines have discussed the advisability of increasing the class rates from the East to Pacific coast terminals so as to make them exceed the rates fixed by the commission as reasonable to Reno and other intermediate points. The first-class rate from New York to San Francisco is now $3 per 100 pounds and the commission having fixed the rate of $3.50 as reasonable to Reno, the carriers will probably ask to make the rate to Pacific coast terminals somewhat more than the Reno rate. They have not filed any such new schedules with the Interstate Commerce Commission. The class rates to the Pacific coast apply to only 3 per cent. of the traffic that reaches these points, it is said. It is also stated that there is no intention on the part of the carriers to attempt to obtain any increase on their commodity rates to the Pacific coast.

Interstate Commerce Commission Hearing at Washington on Freight Rate Increases.

The testimony of Messrs. Glasgow, Hathaway and Dodge; Joseph Ramsey and the Grand Rapids furniture men was noticed in the *Railway Age Gazette* last week, pages 1018 and 1026.

The next prominent witness was Henry C. Barlow, formerly a railway traffic officer and now representing the traffic committee of the Chicago Association of Commerce. When he said that the proposed increase in the freight rate would add about one cent to a pair of shoes from New England sold in Chicago, Chairman Knapp asked questions suggesting that possibly so small an addition to the cost would not be felt by the consumer. Moreover, if by the increase in freight rates, general prosperity were promoted, the retailer would probably sell more shoes, and the profit on a single pair, additional, would more than offset the increased cost for freight. Following this colloquy W. L. Fisher, of Chicago, representing shippers, demanded to know if the commission had already reached the conclusion that an advance in rates would be justified because it was small. Mr. Barlow quoted statistics of railway gross and net earnings for the calendar year 1909 and declared that the increase over the preceding year was very much more than the sum which the railways said they had been obliged to add to their pay rolls.

Mr. Butterfield, representing the New York Central, cross-questioned Mr. Barlow, aiming to show that he did not represent actual shippers, the Chicago Association of Commerce having a small membership. Mr. Barlow admitted that his presence at the hearing was due to the action of a traffic committee, consisting of a few large firms, which, under the constitution of the organization, could take such a step without the approval of the general body of members. Mr. Barlow denied that these committee members, of which the firm of Marshall Field & Company was one, were disgruntled because the large rebates formerly enjoyed by them had been discontinued. Mr. Barlow said that in former years, when he was in the railway service, he had paid large shippers rebates amounting to 40 per cent.; "the larger the shipper the higher the rebate."

The witness claimed to know that in Ohio and Indiana the state authorities were going to forbid advances in freight rates, which action would put an unequal burden on interstate shipments.

E. F. Williamson, of Cincinnati, representing the Receivers' and Shippers' Association of that city, formerly in the railway service but for the last seven years traffic manager for the Cincinnati shippers, presented a mass of statistics to show that the railways in trunk line and central territory had made excellent net earnings during the past two years. He reviewed the state of the Lake Shore, Michigan Central, Baltimore & Ohio, Wabash, New York Central, Lehigh Valley, Philadelphia & Reading, Erie and the Pennsylvania. The burden of his statement was that practically all the lines comply with the rules laid down by the presidents who have appeared during the hearings as to what railways should be able to earn to maintain their credit and enjoy prosperity. He asserted that the roads, through their own agencies, had attacked the value of their own securities by agitation based on publications they have issued predicting insolvency unless rates are increased.

George E. Ide, president of the Home Life Insurance Company, testified concerning the interest of life insurance companies in railway properties. Of the nine billions of steam railway bonds in this country, the life insurance companies doing business in the state of New York hold about one-eighth. This ownership is divided among about twenty million policy holders. Any move which even sentimentally affects unfavorably the railways of the land will strike a blow at these securities, which will affect this vast army of thrifty citizens. It is not necessary to reduce railways to a condition of bankruptcy before the value of the underlying securities is affected.

On Tuesday, D. O. Ives, of Boston, representing trade organizations in Atlantic Seaboard cities, gave testimony concerning rebating as practiced when he was a railway traffic officer a

few years ago. He declared that class rates on freight ought not to be changed until the classification of freight has been extensively revised. C. C. McCain, chairman of the Trunk Line Association, explained some of the statements in his pamphlet published some months since containing an argument in favor of increased freight rates.

Following the claim made last week by Mr. Brandeis, counsel for the shippers, that he could show the railways how to make great savings by more economical management, a number of railway officers in Chicago joined in sending him a telegram that if he could make good his claim they would employ him, at his own price. A day or two later the *Chicago Tribune* printed comments on Mr. Brandeis' statement from a number of railway officers.

Daniel Willard, president of the Baltimore & Ohio, said:

"There are practically only two ways in which the roads can reduce operating expenses—one, by the purchase and use of less material, and the other by the employment of less labor. The roads have held their purchases of material on the lowest possible plane for some period back, and this no doubt has had some effect, at least on the general business situation. Even Mr. Brandeis would not dare to urge that improper or insufficient material be left or continued in use in any car or structure; consequently the relief which he says can be found to the extent of $300,000,000 a year by improving operating methods means bluntly that the railways should reduce their pay rolls $300,000,000 a year."

Darius Miller, president of the Burlington, expressed views similar to Mr. Willard's. H. U. Mudge, president of the Rock Island, said:

"Of course, there are possible ways to introduce further economies in railroad operation, but many of them are more theoretical than practical. * * * We know what our unit costs are. We have the piecework system in many of our shops and would like to establish it in others, but we can't afford so many strikes. The piecework and bonus system for shops are good things, but they are obnoxious to organized labor."

Extracts from the statements of other railway officers follow.

T. P. Shonts: "Mr. Brandeis' deductions and conclusions coincide so closely in almost every particular with those expressed by Mr. Harrington Emerson in his book on 'Efficiency' as to lead one to believe Mr. Brandeis' remarks are in a great measure premised on that work.

"Nature's operations are bountiful in waste, and we can hardly excel where nature has failed. Therefore, to measure the work of man on a basis of 100 per centum efficiency in all undertakings, and then calculate in dollars and cents the difference between 100 per centum efficiency and the actual attainment in determining waste, is a fallacy—it is a Utopian condition which cannot, unfortunately, be reached in practice, either in agricultural, mining, industrial or transportation pursuits. * * * If the gentlemen who are now discoursing so learnedly on this problem of railroad waste were in a position to guarantee results they would be in greater demand than any other set of men in the whole world, because railroads today are looking for men who can accomplish these things."

L. W. Hill: "The largest waste of the present day appears in the reckless statements of this kind by prejudiced and uninformed persons. * * * However wide the knowledge of Mr. Brandeis may be in other fields, no one has ever heard him mentioned as possessing a single qualification to entitle him to a respectful hearing as a practical railroad man. If his intemperate utterance contained a modicum of fact, and if he could really show how to save his $1,000,000 a day, he might name his own price for his services to any American railroad."

L. F. Loree:—I do not believe the suggestions put forward by Mr. Brandeis are likely to be of value. Railway officers have spent and are spending untiring efforts in evolving and applying unit tests of efficiency. The results—and they will compare favorably with other lines of business activity—are that the capital investment involved in the movement of a unit of traffic has fallen since 1882 from 12.08 of a cent to 5.75 of a cent, and the charge to the public has been reduced from 1½ cents to a shade less than 1 cent. I see no reason why the tendency, though perhaps not the rate of progress, should not be continued, but, so far as it is the result of intelligent effort and capital investment, it would seem that the results should primarily belong to the shareholders rather than to the jobber.

On Tuesday of this week, Mr. Brandeis replied to the telegram from Chicago offering him a position (which was signed by O. L. Dickeson, inspector of transportation of the Chicago, Burlington & Quincy), saying that he would be glad to confer with the western presidents and that he would like to have the eastern presidents also invited, but he declined to accept any compensation, "for the same reason that I have declined compensation from the shipping organizations"; for he is doing all this for nothing, as a public service.

Switching Allowances to Shippers.

Notwithstanding the opposition from the Wheeling & Lake Erie and other small trunk lines, including the roads owned by the Steel Corporation, the large trunk lines are going ahead with their plans for wiping out all terminal allowances to industrial railways in which the principal shipper has a majority interest. A majority of the railways in the Trunk Line Association have voted to eliminate these allowances on and after January 1, next. Unless the roads voluntarily settle this situation in the near future the commisison has threatened to hand down its decision in the Buffalo Furnace case. The effects of this would be so far reaching, the commission has unofficially intimated, that they (the commissioners) hope the matter can be be settled without the necessity of a decision, which has now been purposely delayed for over a year.

Considerable criticism has been directed against the Wheeling & Lake Erie, which has interposed the strongest opposition. Receiver Worthington believes that terminal allowances such as exist on his road are legal and can be proved so. He has issued several pamphlets presenting a defense of the system. He claims that without these the small road cannot exist in competition with the large road. * * * Receiver Worthington has always aimed to grant slightly better terminal allowances and per diem arrangements to industrial roads than the other large lines were willing to concede. The large lines could, if they wished, meet this allowance, but if this practice were started there is no telling where it would end.

For instance, he has allowed the Newburgh & South Shore, a Steel Corporation road, five cents a ton larger allowance than any of its competitors would concede, and in one year the Wheeling took $1,000,000 worth of traffic away from the Pennsylvania by this method. In the old days of pooling arrangements it would have been a simple matter to have made some traffic arrangement by which the Wheeling could have an offset for the traffic it would lose by elimination of these allowances. This is no longer possible. There seems to be a well-rooted impresison that the large trunk lines will not find it possible to effect the adjustment on January 1. The New York Central, Baltimore & Ohio and the Pennsylvania are leading the movement.—*Wall Street Journal.*

INTERSTATE COMMERCE COMMISSION.

Reparation Awarded.

Hydraulic-Press Brick Co. v. Mobile & Ohio et al. Opinion by Commissioner Prouty:

Reasonable rate for transportation of brick from Cheltenham, Mo., to Tuscaloosa, Ala., prescribed. (19 I. C. C., 530.)

J. W. Johnson Co. v. Clyde Steamship Co. et al. Opinion by Commissioner Lane:

Various less-than-carload shipments of cotton-shoddy lining from Philadelphia, Pa., to Chicago, Ill. (19 I. C. C., 512.)

George M. Spiegle & Co. et al. v. Southern Railway Company. Opinion by Commissioner Lane:

The milling-in-transit rates on lumber at Newport, Tenn., are excessive and discriminatory. (19 I. C. C., 522.)

Block-Pollak Iron Co. v. Houston East & West Texas. Opinion by Commissioner Lane:

Initial carrier failed to route a shipment over a line carrying a rate inserted by the shipper in the bill of lading when such route was available. (19 I. C. C., 505.)

St. Louis Hay & Grain et al. v. Mobile & Ohio et al. Opinion by Commissioner Clements:

The question involved in each of these cases is the reasonableness of defendants' reconsignment charge at East St. Louis on

shipments of hay originating at points north, west and east thereof and subsequently reconsigned to southeastern destinations. Complaint was first made in case No. 757, and the commission in that case found the cost to the carriers of such reconsignment service at East St. Louis not to exceed 1 cent per 100 lbs. and awarded reparation to that basis, 11 I. C. C., 90. The defendants refused to pay the reparation and suit was brought in the United States circuit court for the eastern district of Illinois, which rendered judgment for complainant in accordance with the order of the commission, and this judgment was affirmed by the United States circuit court of appeals for the seventh circuit. The Supreme Court, on appeal, reversed the lower court and held that carriers are entitled to a reasonable profit on the service performed by them under a reconsignment privilege as well as on the transportation proper. The case was remanded to the circuit court with instructions to send the matter back to the commission for further investigation and report, 214 U. S., 297.

In the meantime the other complaints were presented to the commission.

In these stipulations the claims barred by the limitation provision of the act as interpreted by the commission have been eliminated and the reparation agreed upon is based on one-half cent per 100 lbs. In other words, accepting the commission's finding of the cost to the defendant carriers of this reconsignment service at East St. Louis to be 1 cent per 100 lbs., the carriers have been allowed a profit of one-half cent per 100 lbs. (19 I. C. C., 533.)

Reparation Denied.

Orange Grocery Co. v. Morgan's Louisiana & Texas Railroad & Steamship Co. et al. Opinion by Commissioner Prouty:

Rate of 55 cents per 100 lbs. collected on mixed carload of groceries from Orange, Tex., to Eunice, La., a distance of 105 miles, not found unreasonable. (19 I. C. C., 502.)

The Label as an Indication of the Nature of a Commodity.

J. B. Ford Co. v. Michigan Central et al. Opinion by Commissioner Clark:

The complainant manufactures chemicals, one of which is soda ash, intended for a cleanser and for which the trade name, "Wyandotte Cleaner and Cleanser," has been adopted. Official classification ratings are as follows: Washing powder, soap powder, bleach or bleaching, dry in kegs or barrels, washing soda powder, cleaning and cleansing, N. O. S. dry and packages, and C. L., minimum weight 36,000 lbs., fifth class; soda ash same minimum weight, sixth class. The defendants say that Wyandotte Cleaner and Cleanser is advertised as a household washing and cleansing compound, and that as such it enters into competition with other cleaning compounds which take the fifth-class rate, and that it differs from the soda ash of commerce in that the latter is of a lower grade of less value. The commission expresses in effect the opinion that if Wyandotte Cleaner and Cleanser is to be carried as soda ash and at the soda ash rates, shipments should be so billed or at least this name should be included as well as the trade name. The complainant, while willing to insert in the bills of lading "soda ash" (trade name, Wyandotte Cleaner and Cleanser), objected to show such designation on the packages. The commission could not justify giving this commodity the benefits of a low rating as soda ash unless the shipments were in fact soda ash and were shipped and designated as such. The commission believes that if a simple commodity is given a trade name which does not disclose its real nature and is shipped and sold in competition with other compounds intended for the same uses, it should be rated the same as those other compounds, and that in order to be entitled to the low rating it should be shipped openly as the simple commodity which it is in fact.

Suspensions of Tariffs and Proposed Hearings.

The Interstate Commerce Commission will begin at New Orleans, La., on December 8 an investigation of the relations between the trunk lines and the so-called "tap line" railways. The Commission has already accumulated a large amount of information on this subject through its examiners, which will be used as a basis for the public investigation.

Upon presentation by the transcontinental lines of the inequalities that would result from the enforcement at this time of the new transcontinental rates ordered by the Commission in the Sacramento, Reno and Phoenix cases, the Commission has changed the date for these new rates to go into effect from December 1 to January 2. The railways said that the application of these rates would throw out of adjustment many of their tariffs and they desired the extra time to make all rates harmonious.

Truck Farm Products Rates.

Ponchatoula Farmers' Association, Limited, v. Illinois Central. Opinion by Commissioner Cockrell:

Defendant's rule authorizing carload rates on mixed carloads and providing that any deficit in minimum shall be made up by adding to the weight of the highest rated article, found unreasonable and ordered amended to provide that deficit in weight shall be made by adding to the weight of the heaviest loaded article. Minimum weight of 18,000 lbs. on strawberries from Ponchatoula, La., to Chicago, Ill., unreasonable in so far as it exceeds 17,000 lbs. Carload rate of 58½ cents per 100 lbs. on lettuce from Ponchatoula, La., to Chicago, Ill., unreasonable in so far as it exceeds 55 cents. Defendant's "owner's-risk" rule was vague and misleading and warranted complainant's objection. Rule as corrected, effective June 6, 1910, appears to remove cause of complaint. Many other matters complained of are either beyond the commission's jurisdiction or are not presented on any basis that would authorize the commission to grant relief. (19 I. C. C., 513.)

STATE COMMISSIONS.

The Railroad Commission of Wisconsin, in regard to a complaint against an increase in rates on beer from Waukesha to Milwaukee from 3 to 4 cts. per 100 lbs., holds that freight rates that have been in effect long enough so that industrial and commercial conditions have been adjusted and established under them should not be increased except for good reason, and that the burden of proof for such increase rests on the carrier. On the basis of the cost of the service involved, the competitive and commercial conditions with which the petitioner is confronted, a rate of 3 cts. per 100 lbs., is reasonable under all circumstances.

The Railroad Commission of Wisconsin, in a case brought by a railway company against certain individuals and a township, has decided in favor of the complainant (the railway). The railway company had been authorized to build a line from Clyman through Dodge county into Juneau county, and at one point where the survey called for the line crossing a highway the two intersect at such an angle that to carry the highway over on a bridge would have necessitated a dangerously long structure. The railway proposed to move the highway. The commission holds that a practical solution of the difficulty has been suggested by the petitioner, and that since the railway company is to bear all the expenses its petition is reasonable.

The New York Public Service Commission, First district, will hold a public hearing on November 30 on an order which has been prepared by the board changing the period during which the Interborough company must provide in its trains a number of seats equal to the number of passengers from thirty minutes to fifteen minutes. Under the existing order the company is required to run only enough trains every half hour to provide seats for all passengers offering during that half hour. It is possible, therefore, for the company to run crowded trains during a portion of the half hour period and make up for the congestion by running trains during the remainder of the period in which there will be enough vacant seats to counterbalance the standing passengers in the trains passing during the first part of the period.

A movement has been started by the Texas railway commission to compel the complete segregation of all railways operating in Texas from all lines operating outside of Texas. William D. Williams, a member of the commission, said in a recent statement that the Texas roads are being constantly milked by the parent system in such a way as to make it appear that their net earnings are smaller than they actually are. Under the existing law each line doing business in the state is required to maintain general offices there. N. A. Stedman, who has been attorney for the principal railways in Texas, said that the charge that the parent companies have not given proper divisions of rates to the lines in Texas is without foundation, and that the books of the companies are kept as required by the Interstate Commerce Commission.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF SEPTEMBER, 1910. (SEE ALSO ISSUES NOVEMBER 11, 18 AND 25.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$97,737	$40,430	$149,125	$19,394	$26,553	$4,634	$53,057	$5,195	$108,833	$40,292	$2	$4,390	$35,904	$5,828
Ann Arbor	301	100,939	48,397	159,380	23,482	19,096	3,746	53,473	6,373	106,170	53,210	3,397	14,265	42,342	—3,681
Arizona Eastern	347*	99,283	33,186	142,655	24,712	15,506	1,440	35,155	4,032	80,845	61,810	.....	4,719	57,091	7,447
Buffalo & Susquehanna *R.R.*	269	135,013	10,160	152,890	33,728	21,519	1,688	43,344	5,793	106,072	46,818	.....	2,600	44,218	—
Carolina, Clinchfield & Ohio	236†	94,771	15,413	114,716	14,101	12,972	5,035	25,118	8,923	66,149	48,567	.....	5,500	43,067	10,962
Charleston & Western Carolina	340	101,460	27,362	135,435	28,335	6,464	3,296	49,048	3,915	91,058	44,377	.....	4,475	39,902	6,119
Chesapeake & Ohio of Indiana	284	107,024	30,210	143,080	30,743	21,799	5,397	61,875	4,882	124,696	18,384	.....	3,790	14,594	—
Chicago, Peoria & St. Louis	255	128,941	26,844	162,993	26,937	30,537	7,618	69,289	5,428	139,809	23,184	.....	4,500	18,684	—10,138
Cincinnati Northern	248	100,360	22,205	128,886	20,963	22,967	4,259	44,241	3,016	95,446	33,440	.....	4,500	28,940	—8,316
Colorado Midland	338	139,926	35,695	195,990	23,681	41,038	5,621	77,460	5,588	153,388	42,602	—557	8,500	33,545	—13,327
Denver Northwestern & Pacific	215	66,696	39,326	111,877	9,995	13,441	3,221	34,000	3,479	64,136	47,741	.....	3,000	44,741	19,413
Detroit, Grand Haven & Milwaukee	190	101,116	70,580	199,801	38,653	20,673	6,103	74,849	4,398	144,676	55,125	—33	3,009	52,083	—15,499
Detroit, Toledo & Ironton	441	161,844	18,705	195,489	33,357	37,077	3,296	86,014	5,621	165,365	30,124	—19	6,712	23,393	—1,451
Duluth, South Shore & Atlantic	605	187,144	97,845	299,154	40,625	28,250	9,959	101,568	6,206	186,608	112,546	1,217	18,000	95,763	—10,624
Fort Worth & Denver City	454	310,688	155,383	487,809	37,176	71,867	6,643	146,838	14,489	277,013	210,796	—636	7,226	202,934	14,734
Georgia	307	173,330	79,140	266,709	29,644	39,825	11,115	106,848	6,442	193,874	72,835	.....	2,643	70,192	—19,876
Georgia Southern & Florida	395	107,050	64,106	197,580	22,390	36,381	6,312	69,489	8,938	143,510	54,070	.....	9,399	44,671	—2,806
Gulf & Ship Island	307	116,079	33,820	160,656	21,667	28,274	1,620	45,804	7,818	105,183	55,473	.....	5,148	50,325	—2,243
Hocking Valley	350	630,262	88,493	770,751	86,963	86,952	7,854	213,659	16,983	412,411	358,340	.....	30,850	327,490	28,615
Louisiana & Arkansas	255‡	99,814	15,330	120,029	24,921	16,828	2,566	32,088	4,186	80,589	39,440	.....	2,500	36,940	—5,526
Louisiana Ry. & Nav. Co	350	101,314	18,595	132,601	27,706	20,828	4,830	52,274	5,565	111,203	21,398	.....	4,400	16,998	—2,006
Louisiana Western	207	118,389	50,579	175,237	17,132	24,262	5,737	47,405	7,256	101,792	73,445	399	6,077	67,767	—8,967
Minneapolis, St. Paul & Sault Ste. Marie	3,572§	1,415,288	494,505	2,017,022	219,032	254,577	40,043	634,389	42,863	1,190,904	826,118	21,664	108,654	739,128	—350,842
New Orleans & North Eastern	196	211,102	52,205	280,890	26,858	45,962	10,553	107,028	11,079	201,480	79,410	—303	8,250	70,857	—7,006
New Orleans Great Northern	282	101,438	31,003	142,925	20,289	19,329	2,981	39,294	4,289	86,182	56,743	—82	1,450	55,211	15,138
New Orleans, Mobile & Chicago	404	107,950	28,911	146,720	20,778	10,537	2,901	43,679	7,779	85,674	61,046	.....	3,890	57,156	14,061
Oregon & Washington	244*a*	81,711	76,504	163,665	13,699	3,326	12,364	73,838	4,438	107,665	56,000	—1,056	3,300	51,644	51,716
Pittsburg, Shawmut & Northern	240	117,322	11,214	130,692	25,236	28,797	2,161	42,702	4,498	103,394	27,298	.....	1,579	25,719	6,314
St. Joseph & Grand Island	319	94,502	43,420	150,903	34,841	20,976	6,420	62,763	5,774	130,774	20,129	178	5,389	14,918	—9,830
St. Louis, Brownsville & Mexico	494*b*	85,423	43,970	139,597	46,914	11,909	2,327	47,012	7,131	115,293	24,304	.....	4,000	20,304	14,064
Santa Fe, Prescott & Phoenix	364*c*	83,063	32,289	124,553	26,270	11,726	2,260	42,426	5,759	88,441	36,112	.....	101	36,011	—16,706
Southern Indiana	236	133,912	20,452	155,995	16,584	42,398	1,620	45,822	4,837	111,261	44,734	—54	6,929	37,751	—4,780
Spokane, Portland & Seattle	430*d*	452,096	100,083	572,123	47,834	46,051	4,539	108,111	9,572	215,907	356,216	—1,324	38,500	316,392	245,266
Tennessee Central	294	78,571	43,921	131,347	18,274	10,252	5,327	36,994	7,579	78,426	52,921	.....	3,980	48,941	4,755
Trinity & Brazos Valley	458	127,648	33,438	166,549	31,994	36,979	7,815	74,656	8,454	159,898	6,651	.....	3,500	3,151	—14,485
Vicksburg, Shreveport & Pacific	171	76,131	39,430	124,046	14,848	22,821	3,733	40,756	4,358	86,516	37,530	41	6,375	31,197	2,107
THREE MONTH OF FISCAL YEAR, 1911.															
Alabama & Vicksburg	143	$271,548	$124,368	$427,561	$54,557	$66,539	$11,898	$141,949	$15,522	$290,465	$137,096	—$84	$13,170	$123,842	$36,704
Ann Arbor	301	280,270	161,793	472,981	69,429	55,961	12,878	157,464	18,399	314,131	158,850	6,092	42,795	122,147	—3,681
Arizona Eastern	347*	294,273	97,820	420,254	76,079	39,426	5,544	115,037	14,037	250,123	170,131	.....	14,157	155,974	14,401
Buffalo & Susquehanna *R.R.*	269	292,650	22,839	330,569	77,060	53,148	4,610	104,468	13,448	252,734	77,835	.....	5,871	71,964	—
Carolina, Clinchfield & Ohio	236†	280,708	52,616	347,859	34,863	54,768	16,139	76,494	25,462	207,726	140,133	.....	16,500	123,633	55,255
Charleston & Western Carolina	340	270,535	93,810	383,138	80,978	54,845	10,316	127,990	11,240	285,369	97,769	.....	13,425	84,344	24,015
Chesapeake & Ohio of Indiana	284	302,900	100,973	422,983	78,521	60,950	21,835	182,671	13,763	357,740	65,243	.....	11,370	53,873	—
Chicago, Peoria & St. Louis	255	346,438	90,310	458,201	77,753	91,173	21,255	185,389	16,190	391,760	66,441	.....	13,500	52,941	—32,804
Cincinnati Northern	248	268,394	81,093	366,867	62,400	70,418	9,897	125,571	8,963	277,249	89,618	.....	13,500	76,118	—17,824
Colorado Midland	338	373,151	121,962	554,197	79,858	111,301	17,040	216,943	16,560	441,702	112,495	—89	25,500	86,906	—16,682
Denver Northwestern & Pacific	215	164,714	170,229	350,598	40,432	41,150	10,671	94,168	11,206	197,627	152,971	.....	9,000	143,971	13,633
Detroit, Grand Haven & Milwaukee	190	226,123	191,028	489,951	83,568	57,370	19,044	230,683	12,968	403,633	86,318	37	9,027	77,329	—68,296
Detroit, Toledo & Ironton	441	443,510	53,542	535,141	92,498	99,144	9,285	249,414	16,950	467,291	67,850	—75	20,136	47,639	—12,614
Duluth, South Shore & Atlantic	605	589,349	311,795	947,616	124,313	92,727	31,792	317,238	25,888	591,958	355,658	6,952	54,000	308,610	38,528
Fort Worth & Denver City	454	820,529	485,149	1,365,843	159,047	206,522	21,233	411,340	41,652	839,794	526,049	—5,477	30,000	490,572	64,540
Georgia	307	442,074	242,696	725,925	117,231	121,160	31,476	303,610	19,800	593,277	132,648	.....	7,010	125,638	—31,344
Georgia Southern & Florida	395	308,859	198,506	581,363	63,964	118,137	18,758	217,391	26,033	444,283	137,080	.....	27,396	109,684	—8,375
Gulf & Ship Island	307	337,160	108,690	476,017	61,786	82,597	5,753	138,195	23,882	312,213	163,804	.....	15,413	148,391	26,942
Hocking Valley	350	1,768,223	261,673	2,186,400	246,293	284,316	28,359	633,719	47,880	1,240,567	945,833	.....	88,670	857,163	93,314
Louisiana & Arkansas	255‡	301,028	48,421	363,547	64,730	49,450	7,542	92,229	12,741	226,692	136,855	.....	7,600	129,255	21,212
Louisiana Ry. & Nav. Co	350	295,851	60,479	394,806	77,252	52,116	14,303	157,504	17,542	318,717	76,089	.....	13,200	62,889	12,251
Louisiana Western	207	308,431	152,741	482,609	47,056	82,298	17,544	137,788	21,055	305,741	176,868	627	18,231	159,263	—25,458
Minneapolis, St. Paul & Sault Ste. Marie	3,572§	4,082,888	1,510,735	5,955,108	649,299	743,263	118,025	1,929,329	118,897	3,558,813	2,396,295	64,954	341,976	2,119,274	—389,230
New Orleans & North Eastern	196	632,017	163,885	848,502	83,193	126,935	28,914	293,398	31,696	564,136	284,366	—331	24,750	259,285	49,849
New Orleans Great Northern	282	302,571	101,300	436,213	62,122	58,742	8,926	111,785	12,758	254,333	181,880	—238	4,350	177,292	75,663
New Orleans, Mobile & Chicago	404	296,070	86,615	412,714	65,176	28,403	9,240	129,336	22,546	254,701	158,013	.....	11,303	146,710	32,889
Oregon & Washington	244*a*	228,860	234,007	484,525	41,980	13,534	33,006	197,230	12,257	298,007	186,518	—2,864	9,900	173,754	173,386
Pittsburg, Shawmut & Northern	240	321,666	33,171	360,182	77,993	87,422	4,413	119,737	14,157	303,722	56,460	.....	4,756	51,704	—1,636
St. Joseph & Grand Island	319	284,954	134,812	456,213	107,610	60,449	19,553	192,677	17,168	397,457	58,756	279	16,166	42,869	—53,357
St. Louis, Brownsville & Mexico	494*b*	248,178	131,404	413,493	124,444	42,726	6,481	148,763	22,353	344,767	68,726	.....	12,000	56,726	20,783
Santa Fe, Prescott & Phoenix	364*c*	257,047	108,371	395,603	79,406	35,947	7,796	129,221	16,076	268,446	127,157	.....	300	126,857	—26,023
Southern Indiana	236	409,824	59,269	474,496	56,584	114,512	4,894	137,852	15,526	329,368	145,128	—575	20,786	123,767	—4,317
Spokane, Portland & Seattle	430*d*	1,049,245	280,886	1,385,095	151,278	94,452	11,159	332,589	24,656	614,134	770,961	130	82,100	688,991	344,231
Tennessee Central	294	243,891	115,140	381,660	50,883	31,989	15,581	105,776	22,750	226,979	154,681	.....	11,940	142,741	17,544
Trinity & Brazos Valley	458	282,644	102,562	399,716	98,590	102,115	23,159	217,519	26,361	467,744	—68,028	.....	10,500	—78,528	—45,576
Vicksburg, Shreveport & Pacific	171	227,950	123,613	376,929	49,891	67,586	11,342	114,671	13,386	256,876	120,053	331	19,125	101,259	24,099

Mileage operated on September 30, 1909.—* 299 miles; † 211 miles; ‡ 226 miles; § 3,425 miles, including Wisconsin Central for both years; *a* 6 miles; *b* 455 miles; *c* 257 miles; *d* 263 miles; — indicates Deficits, Losses and Decreases.

Illinois Coal Rates Increased.

The Illinois Railroad and Warehouse Commission has granted the railways the right to increase rates 7 cents a ton on coal between Illinois mines and various industrial centres of the northern part of the state. Chairman Berry, in announcing the decision, said:

"After hearing the testimony offered by both sides, the commission employed experts of its own to make a careful investigation from the books of the railways. This was done in great detail, and the figures show that without considering interest on the bonds or dividends on the stock, the actual cost of transporting coal is such that the roads are entitled to some advance. Then, applying certain principles to the bonds and improvements, and 6 per cent. on the stock, with perhaps one exception we have decided to give the roads what these figures and principles would entitle them to."

COURT NEWS.

The United States circuit court for the northern district of California on November 25 denied the applications made by the Southern Pacific, the Atchison, Topeka & Santa Fe and their connections for injunctions to restrain the Interstate Commerce Commission from enforcing the orders made by it in the transcontinental rate cases for reductions in the rates to and from Reno, Nev., and to Phoenix, Ariz.

At Reno, Nev., last week an injunction was issued restraining the governor, attorney-general, board of railway commissioners and the Tonapah & Goldfield Railroad from putting into effect the rate on forest products lately ordered by the state board of railway commissioners. An injunction will also be issued against the Southern Pacific. The constitutionality of the state railway commission law is challenged. The bill states that the new rate is confiscatory.

Deductions for Obsolescence Justified.

The Supreme Court of New York in a decision by Justice Le Boeuf, handed down November 25, sustains the Brooklyn Rapid Transit Company in its protest against a special franchise tax assessed against it. In assessing this tax the state tax commissioners fixed the value of certain property of the company in the Borough of Queens at $1,365,842. This included a large sum for franchises which Judge Le Boeuf holds have no value which can be taxed, under the law, according to the net earnings rule, and the assessment is ordered reduced about 80 per cent.

In reaching this conclusion Justice Le Boeuf enunciates a new principle in connection with the valuation of special franchises by the State Tax Commission, in that he holds that there may be a charge off from the gross earnings of a public service corporation for obsolescence of railway equipment, as distinguished from depreciation from ordinary wear, thus reducing the value of a special franchise when the value is based on net earnings. He says:

If the State Tax Commission's decision is to be construed as laying down the rule that no allowance shall be made for obsolescence or inadequacy of equipment, not yet sustained, but capable of reasonable ascertainment for the future, it does not appear to me to be consistent with the expressed policy of this state. As surely as humanity travels from the cradle to the grave the machinery and equipment of a public service corporation travels toward the scrap pile.

But another form of depreciation takes place. The machinery or equipment while still capable of years of service becomes inadequate to do the work demanded. In the case particularly of electrical machinery the type becomes obsolete by reason of invention. Some of these changes are capable of definite ascertainment. Many of them may be provided against for the future by setting aside from gross earnings a reasonable sum to create a reserve against the day when they shall come. The Public Service Commission law recognizes this amortization principle, and yet the State Tax Commission is insistent that no reasonable basis exists for the creation of an amortization fund. If a public service corporation comes into court and requests that it be permitted to set aside a reasonable amount of its gross earnings for such an amortization fund it is difficult to understand why the court should refuse to consider that request.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

L. C. Esschen has been appointed acting auditor of passenger receipts of the Illinois Central, with office at Chicago, succeeding A. D. Joslin, deceased.

D. Crombie, assistant to general transportation manager of the Grand Trunk, at Montreal, Que., has been appointed assistant to first vice-president, with office at Montreal.

William T. Noonan, vice-president and general manager of the Buffalo, Rochester & Pittsburgh, has been elected president, with office at Rochester, N. Y., succeeding Adrian Iselin, Jr., who becomes vice-president, with office at New York.

Operating Officers.

J. A. Jones has been appointed a trainmaster of the San Pedro, Los Angeles & Salt Lake, and C. H. Esender has been appointed chief despatcher, both with offices at Los Angeles, Cal.

H. J. Plumhof has been appointed an assistant superintendent on the Idaho division of the Oregon Short Line, with office at Pocatello, Idaho.

B. A. Campbell, traveling conductor on the Western division of the Southern Pacific at Oakland Pier, Cal., has been appointed trainmaster of the Suisun district, with office at Oakland Pier, succeeding G. D. Wright, promoted.

E. W. Deuel, assistant superintendent on the Fourth division of the Denver & Rio Grande at Durango, Colo., has had his jurisdiction extended over the First and Second districts and the Creede and Santa Fe branches. J. R. Yeager has been appointed an assistant superintendent, with jurisdiction over the Third district and the Silverton and Farmington branches. His headquarters will be at Durango.

The lines operated by the Atchison, Topeka & Santa Fe (western lines), the Southern Kansas Railway of Texas, the Pecos & Northern Texas and the Eastern Railway of New Mexico have been divided into two districts as follows: the Northern district, comprising the Western, Arkansas River, Colorado, New Mexico and Rio Grande divisions, under the jurdisdiction of J. M. Kurn, general superintendent at La Junta, Colo.; and the Southern district, comprising the Panhandle, Plains and Pecos divisions. G. C. Starkweather, superintendent of the Eastern Railway of New Mexico and the Southern Kansas Railway of Texas at Amarillo, Tex., has been appointed general superintendent of the Southern district, with office at Amarillo. The Pecos division is a new division consisting of a portion of the Rio Grande division of the Atchison, Topeka & Santa Fe and a portion of the Eastern Railway of New Mexico. E. W. Peabody has been appointed assistant to the general manager, with office at Amarillo. J. E. McMahon, trainmaster of the Santa Fe at La Vegas, N. Mex., has been appointed superintendent of the Pecos division, as above, with office at Clovis, N. Mex.; and D. Elliott, assistant superintendent of the Eastern Railway of New Mexico and the Southern Kansas Railway of Texas at Amarillo, has been appointed superintendent of the Plains division, with office at Amarillo.

William W. Waits, whose appointment as superintendent of terminals of the Southern Railway, at Atlanta, Ga., has been announced in these columns, was born February 9, 1869, at Atlanta. He was educated in the public schools and began railway work on February 16, 1887, with the Central of Georgia, as a switchman. He was later yard conductor and night yard master. In October, 1890, he went to the East Tennessee, Virginia & Georgia, now a part of the Southern Railway, as yard conductor, at Atlanta, and then for five years was yard conductor and yard master of the Western Railway of Alabama and the Atlanta & West Point, at Montgomery, Ala. In October, 1896 he went to the Southern Railway as yard conductor, and one year later was appointed assistant yard master. The following year he was appointed general night yard master, remaining in that position for six years. In August, 1904, he was promoted to

general yard master, which position he held until his recent appointment as superintendent of terminals, at Atlanta. When Mr. Waits went to the Southern Railway, the company worked at Atlanta 12 switch crews night and day; it now has 35 crews, and there are 48 daily passenger trains and an average of 90 freight trains. The number of yard employees is 500, and the number of cars handled is 2,500 a day. The terminals and belt lines aggregate 35 miles of line and 325 miles of track, including storage for 7,000 cars. The number of regular passenger crews coming into Atlanta is 90, and of freight crews 115. The Atlanta terminals handles the business from five divisions. There are four large freight houses and 118 industrial plants to be served daily.

Edward Raymond

Edward Raymond, whose appointment as general superintendent of the Atchison, Topeka & Santa Fe at Newton, Kan., has been announced in these columns, was born on May 31, 1858, at Kendal Corners, N. Y. Mr. Raymond received a common school education and began railway work in 1878, with the Atchison, Topeka & Santa Fe as a section foreman. He was promoted to roadmaster, and was later appointed trainmaster. His next position was assistant superintendent. He was then appointed division superintendent, and at the time of his recent promotion he was division superintendent with office at Chillicothe, Ill.

Traffic Officers.

H. K. Mack has been appointed a commercial agent of the Chicago, Burlington & Quincy, with office at Paducah, Ky.

J. C. Hall has been appointed a traveling freight claim agent of the Sunset Route, at Houston, Tex., succeeding J. C. Gilbert, deceased.

J. P. Stephens has been appointed a commercial agent of the Rock Island Lines, with office at Atchison, Kan., succeeding F. M. Darrah, deceased.

H. C. Moran has been appointed contracting agent of the Missouri, Kansas & Texas, with office at Houston, Tex., succeeding L. H. Saunders, promoted.

John K. Thorn has been appointed a soliciting freight agent of the Seaboard Air Line, with office at Philadelphia, Pa., succeeding William F. Barwell, resigned to go to another company.

T. E. Harris, traveling freight agent of the Georgia, Southern & Florida at Cordele, Ga., has been appointed a traveling freight and passenger agent of the Georgia & Florida, with office at Valdosta, Ga.

L. B. Washington has been appointed district passenger agent of the St. Louis & San Francisco, the Chicago & Eastern Illinois and the Evansville & Terre Haute, with office at Jacksonville, Fla., succeeding W. L. Evans, promoted.

W. I. Jones, chief clerk to the freight traffic manager of the Missouri Pacific-Iron Mountain system at St. Louis, Mo., has been appointed assistant general freight agent, with office at St. Louis, Mo., succeeding R. E. Eggebrecht, resigned to become vice-president of the Standard Collieries Company.

A. E. Brainard, district passenger agent of the New York Central & Hudson River, the West Shore and the Boston & Albany, at Williamsport, Pa., has been appointed general traveling passenger agent, with office at New York. Frank G. Halloran, traveling passenger agent at Williamsport, succeeds Mr. Brainard.

Emmett J. Carland has been appointed traveling agent of the Chicago, St. Paul, Minneapolis & Omaha on lines of the Northern Pacific and the Great Northern west of Mandan and Minot, N. D., and east of De Smet and Columbia Falls, Mont., succeeding Wm. T. Condon, deceased. He will report to the general agent at Helena, Mont.

L. J. Spence, general eastern freight agent of the Southern Pacific Company, and general freight agent of the Southern Pacific steamship lines at New York, has been appointed assistant director of traffic of the Union Pacific and the Southern Pacific System, with office at Chicago, succeeding T. M. Schumacher, resigned.

Truman H. Clark, contracting freight agent of the Chicago, St. Paul, Minneapolis & Omaha at Minneapolis, Minn., has been appointed general agent, with office at Superior, Wis., succeeding George H. Kirk, resigned on account of ill health. He will have charge of freight and passenger traffic at Superior and South Superior, Wis. Thomas G. Keogh succeeds Mr. Clark.

Clarence M. Knox has been appointed district freight agent of the Sunset Route (the Galveston, Harrisburg & San Antonio, the Texas & New Orleans, the Louisiana Western, Morgan's Louisiana & Texas and the Atlantic steamship lines of the Southern Pacific, with office at Los Angeles, Cal. Walter R. Van Sickler has been appointed a traveling freight agent, and Fred D. Ogden a contracting freight agent, both with office at San Francisco, Cal.

Albert H. Hanson, passenger traffic manager of the Illinois Central and the Indianapolis Southern, with office at Chicago, will retire from that office on December 31 on a pension. Mr. Hanson was born at Salem, Mass., in 1846, and has been with the Illinois Central continuously for 41 years. He began in the general freight office, was then placed in charge of claims in that office, was secretary to the general superintendent and then assistant general passenger agent. For 25 years from June, 1880, he was general passenger agent, and since 1905 has been passenger traffic manager.

Harry W. Brodie, whose appointment as general passenger agent of the Canadian Pacific, western lines, west of Revelstoke, B. C., with office at Vancouver, B. C., has been announced in these columns, was born June 8, 1874, at Fredericton, N. B. He was educated in the public schools, and began railway work January 1, 1895, with the Canadian Pacific, as a stenographer, at St. John, N. B., and was later transferred to Boston, Mass. In October, 1895, he was appointed chief clerk, at Toronto, Ont., and from October, 1899, until the time of his recent appointment as general passenger agent, he was chief clerk and assistant general passenger agent of the same company, at Winnipeg, Man..

Charles B. Foster, who was appointed general passenger agent of the Canadian Pacific, western lines, Revelstoke, B. C., and east, with office at Winnipeg, Man., as previously announced in these columns, was born September 30, 1871, at Kingston, Kings county, N. B. Mr. Foster was educated in the public schools, and began railway work April 1, 1891, with the Canadian Pacific, as a stenographer, at St. John, N. B. In September, 1893, he was appointed traveling passenger agent, remaining in that position until August, 1899, when he was appointed chief clerk in the district passenger department at St. John. From February 8, 1902, to November 22, 1904, he was district passenger agent at St. John, and was then transferred to Toronto, Ont. He was appointed assistant general passenger agent at Vancouver, B. C., in September, 1908, which position he held at the time of his recent appointment as general passenger agent.

Engineering and Rolling Stock Officers.

George S. Hunter has been appointed assistant master mechanic of the Missouri Pacific-Iron Mountain system, with office at Jefferson City, Mo.

E. J. Snell has been appointed a master mechanic on the Pennsylvania division of the New York Central & Hudson River, with office at Corning, N. Y.

Alfred E. Calkins has been appointed assistant to the superintendent of rolling stock of the New York Central & Hudson River, with office at New York.

Willard Kells, master mechanic of the Buffalo division of the Lehigh Valley, has been appointed assistant to the general superintendent of motive power of the Atlantic Coast Line.

George H. Eck has been appointed master mechanic of the Hudson River division of the New York Central & Hudson River, with office at New Durham, N. J., succeeding C. E. Keenan, resigned.

John Leisenring, signal engineer of the Hudson & Manhattan, at New York, has been appointed to the new position of signal engineer of the Illinois Traction System, with office at Peoria, Ill., effective December 15.

A. R. Fugina, formerly assistant signal engineer of the Chicago & North Western, has been appointed signal engineer of the Louisville & Nashville, with office at Louisville, Ky., succeeding C. J. Cannon, resigned.

A. Dinan, whose appointment as mechanical superintendent of the Southern district of the Atchison, Topeka & Santa Fe, with office at Amarillo, Tex., has been announced in these columns, has been appointed also mechanical superintendent of the Southern Kansas Railway of Texas, the Pecos & Northern Texas and the Eastern Railway of New Mexico.

D. D. Robertson, master mechanic of the Wyoming division of the Lehigh Valley, at Wilkesbarre, Pa., has been appointed master mechanic of the Buffalo division, with office at Buffalo, N. Y., succeeding W. Kells, resigned, to go to another company. W. G. Burrows, master mechanic of the Mahanoy & Hazleton division, at Weatherly, Pa., succeeds Mr. Robertson, and T. H. Malican succeeds Mr. Burrows.

Purchasing Officers.

W. J. Diehl, traveling storekeeper of the Lake Shore & Michigan Southern, has been appointed general storekeeper of the Mobile & Ohio and the Southern Railway in Mississippi, with office at Mobile, Ala.

OBITUARY.

W. H. Field, until a year ago treasurer of the Houston & Texas Central, with office at Houston, Tex., died at Montgomery, Ala., on November 23.

Charles A. Johnson, commercial agent of the Chicago, Burlington & Quincy at Chicago, died in Chicago on November 24. Mr. Johnson was 54 years old and had been connected with the Burlington for 38 years. He was one of the founders of the Traffic Club of Chicago.

Jonathan Dwight, formerly connected with the engineering department of the New York Central & Hudson River, died at his home in New York this week at the age of 80 years. Mr. Dwight was a graduate of Harvard in the class of 1852. After leaving Harvard he went to West Point and studied civil engineering and was later instructor in military engineering there. He then went West and was interested in building one of the first railways west of the Mississippi river, the Hannibal & St. Joseph, now a part of the Chicago, Burlington & Quincy. He was later a consulting engineer and for a time was a chief engineer on the New York Central. He also supervised the construction of many of that company's bridges. He had charge of the laying of the foundations of the Statue of Liberty in New York harbor.

Danton H. Nichols, of Springfield, Mass., former president of the Kansas Southwestern, died November 27, at Monroe, La. Mr. Nichols was born August 14, 1849, at Lima, Ohio, and began railway work July 12, 1866, as a clerk and office boy on the St. Louis & San Francisco. In October, 1875, he was appointed superintendent of the Atlantic & Pacific division of the same road. He was appointed superintendent of transportation in June, 1881, and about five years later was made general superintendent. In November, 1890, he was appointed superintendent of the New York & New England, now a part of the New York, New Haven & Hartford, and the following month was made general superintendent of the same road. He was out of railway service from January, 1892, to February, 1896, when he was appointed superintendent of the Pecos Valley Railway, and from October, 1898, to January, 1902, was general manager of the Pecos System and Pecos Railway Construction & Land Company, and vice-president of the Pecos & Northern Texas. He was elected president of the Kansas Southwestern in January, 1902, and in February of the following year was appointed superintendent of the St. Louis & Gulf, and division superintendent of the St. Louis, Memphis & Southeastern, both of which are 'Frisco Lines. At the time of his death Mr. Nichols represented New York interests engaged in promoting the building of a line from Monroe, La., across southwestern Arkansas.

Octave Chanute died on November 23 at his home in Chicago. Mr. Chanute was seriously ill of pneumonia in Europe last summer but recovered sufficiently to come home in October. He was born in Paris in 1832 and was brought to this country as a child. He began work in 1849 on the construction of the Hudson River Railroad. After four years on this road, he was on construction work on part of the Chicago & Alton. In 1854 he was made chief engineer of the eastern part of the Toledo, Peoria & Warsaw. After he built this he remained in charge of maintenance of way until 1861, when he went to the Pittsburgh, Fort Wayne & Chicago as division engineer. A year later he was made chief engineer of maintenance of way of the Western division of the Ohio & Mississippi, and in 1863 went to the Chicago & Alton as chief engineer. Four years later he was made chief engineer in charge of the construction of the Missouri river bridge at Kansas City, having, while still on the Alton, won a prize for a design for a bridge across the Missouri at St. Charles, Mo., and also made a design for the union stock yards at Chicago. While he was building the Kansas City bridge he was made also chief engineer of the Kansas City, Fort Scott & Gulf, and later put in charge of the building of several other roads in Kansas. He also designed and built the union stock yards at Kansas City. In 1871 he was made general superintendent of the Leavenworth, Lawrence & Galveston, and in 1873 went to the Erie as chief engineer. During his ten years' service on the Erie he put through important improvements, including double-tracking, grade revision and making the road standard gage. He was made assistant general superintendent in 1875. In 1884 he opened an office as consulting engineer at Kansas City, and during the next few years was in charge of construction of certain bridges on the Chicago, Burlington & Northwestern and the Atchison, Topeka & Santa Fe, including the one over the Mississippi at Ft. Madison, Iowa, and the one over the Missouri at Sibley, Mo., being consulting engineer for the latter. In 1885 he organized the Chicago Tie Preserving Co., using zinc chloride. This company, which has been succeeded by the firm of O. Chanute & Co., later took up also zinc-tannin, zinc-creosote and other processes.

Octave Chanute

Mr. Chanute became a member of the American Society of Civil Engineers in 1868. He was vice-president in 1880 and president in 1891. He was president of the Western Society of Engineers in 1901, and at the time of his death was an honorary member of that society, as well as of the Institution of Civil Engineers (Great Britain), the Society of Civil Engineers (France) and the Chilean Society of Engineers. He was a member of the Canadian Society of Cvil Engineers, the American Institute of Mining Engineers, the American Railway Engineering and Maintenance of Way Association and a number of aeronautical societies. He leaves a son and three daughters. We publish in another column some brief comments on Mr. Chanute's career.

Railway Construction.

New Incorporations, Surveys, Etc.

ALBERTA CENTRAL.—This company has applied to the parliament of Canada for power to build a line from Saskatoon, Sask., northeasterly to Hudson Bay, with terminals at both Fort Churchill and Port Nelson. The company has under consideration the question of building a line from Red Deer, Alb., westerly for 70 miles, also easterly from Red Deer to Moose Jaw, Sask., 40 miles. J. T. Moore, president; J. G. MacGregor, chief engineer, Red Deer, and Smith & Johnson, solicitors. (October 21, p. 759.)

BARTLETT-FLORENCE.—An officer writes that this company was organized to build from Milano Junction, Tex., northwest to Lampasas, 94 miles. The line is now in operation from Bartlett, west to Jarrell, about 11 miles, and grading work has been finished, ready for ties between Jarrell and Florence, on 12 miles. The work has been stopped for the present.

BOSTWICK RAILROAD.—This company, which operates a line from Bostwick, Ga., to Apalachee, six miles, has projected an extension from Bostwick to Monroe, 14 miles.

CALIFORNIA ROADS.—G. W. Cartwright, Sacramento, Cal., and associates are said to be back of a project to build a line between Fresno and Monterey.

CAZENOVIA & SAUK CITY.—This company is planning to build a line from Cazenovia, Wis., southeast to Sauk City.

CHERRYVALE, OKLAHOMA & TEXAS.—Grading has been finished on about 20 miles between Caney, Kan., and Vinita, Okla., 62 miles. The Continental Construction Company, Caney, are the contractors.

CHICAGO, MILWAUKEE & PUGET SOUND.—Work is now under way between Eagle Butte, S. D., and Faith, 42 miles; from Lewistown, Mont., northward 12 miles, and from Lewistown, eastward 24 miles.

COLORADO & NORTHERN.—Surveys are being made for a line from Hayden, Colo., to Hahn's Peak, 45 miles. A. A. Johnson, vice-president and general manager, 721 Equitable building, Denver.

COPPER RANGE.—An officer writes that work is now under way by the company's men on about one-half mile of line, to the Indiana mine, in Michigan, and surveys are being made for a line, about one-quarter of a mile long, from Greenland Junction to South Lake mine.

DENVER, NORTHWESTERN & PACIFIC.—An officer is quoted as saying that surveys have been made for piercing a tunnel, 4.1 miles long, through the main range of the Rocky mountains; the eastern portal of the tunnel is to be located at a point three miles west of Tolland, Colo., at an elevation of 9,470 ft., and the western portal in the Fraser river valley, about three miles southeast of Vasquez. The existing line crosses the mountain at an elevation of 11,600 ft. at Corona. The proposed tunnel will save a climb of 2,130 ft., and will shorten the main line about 16.5 miles.

EL DORADO & WESSON.—An officer writes that this company, which operates about 10 miles of line from El Dorado, Ark., to Wesson, has work under way on an extension from Wesson, southwest for 20 miles. The Edgar Lumber Company are the contractors. The line is eventually to be extended to Shreveport, La., 82 miles from Wesson.

FLORIDA RAILWAY.—An officer writes that work is now under way by the Florida Construction & Realty Company, Jacksonville, Fla., on an extension from Live Oak, east to Jacksonville, 82 miles, and from Jacksonville, north to Fernandina, 29 miles. Grading work is about half finished. Surveys are being made for an extension from Perry to Tallahassee, about 50 miles. (March 11, p. 546.)

GARDEN CITY, GULF & NORTHERN.—An officer writes that work is now under way by A. J. Canady, Scott City, Kan.; Green & Davis, and P. Gleeson, both of Liberal, from Garden City to the Chicago, Rock Island & Pacifi, 16 miles; also from Scott City to Grove, 20 miles, and surveys are being made on an additional 50 miles. (September 23, p. 558.)

GEORGIA, SOUTHWESTERN & GULF.—An officer writes that this company has finished locating a line from Albany, Ga., southwest via Newton and Colquitt to Donaldsonville, 60 miles. No construction work has yet been done. D. B. Dunn, chief engineer, Albany.

GRAND TRUNK.—Work is now under way by the Midland Construction Company, Midland, Ont., on a line from Midland to Wyevale, 8.9 miles.

GREAT NORTHERN.—The report of this company for the year ended June 30, 1910, shows that new lines were completed and opened for operation during the year as follows: From Columbia River station, Wash., northeast to Mansfield, 60.62 miles; extension from Nashwauk, Minn., south to a connection with the main line at Gunn (near La Prairie), 22.07 miles; extension of the Vancouver, Victoria & Eastern Railway & Navigation Company, from Keremos, B. C., northwest to Princeton, 40.91 miles; branch line from Spokane, Wash., to a connection with the tracks of the Spokane, Portland & Seattle, 2.16 miles; branch line from Bainville, Mont., north to Plentywood, 52 miles, is nearing completion, track laying has been finished; the branch from Stanley, N. D., northwest to Powers Lake, 24 miles, has been extended to Wildrose about 51 miles from Stanley, grading to Wildrose and bridging between Stanley and Powers lake, will be finished in 1910, and the line will be ready for track laying early in 1911.

Work was begun during the year on new lines as follows: Oroville, Wash., southerly, following the Okanogan and Columbia rivers to Pateros, 78 miles. Grading will be finished in 1910, and the line will be ready for track laying early in 1911. This line will traverse a fruit and agricultural section already partially developed and settled, and ultimately will be extended southerly along the Columbia river to a connection with the main line at Wenatchee, considerable right-of-way for this extension has been secured; a line from the main line at Fargo, N. D., northwesterly to a connection with the main line at Surrey, about 255 miles, is to be built through a good agricultural section already well settled and under cultivation. This new line will shorten the distance for through traffic and relieve congestion on the present main line through North Dakota, about 18 miles of track will be laid on the Surrey end during 1910; a branch from Vaughn, Mont., west of Great Falls, westerly to Augusta, about 40 miles, has been located and grading work has been begun between Vaughn and Simms, this line will run through the Sun river valley and through the territory to be served by the government's Fort Shaw or Sun river irrigation project, the work has been suspended for the present; grading work is now under way on an extension of the Vancouver, Victoria & Eastern, from Princeton, B. C., northwest to Tulameen, and on another section from Abbotsford, near Sumas, easterly to Chilliwack; surveys for and locations of several other lines, principally in North Dakota, Montana and Washington, have been made during the year. A number of new passenger stations have been built at various places and some shop improvements have been carried out during the year. The building of additional passing tracks, extension of existing ones, and laying other sidings and spur tracks, has been continued. The work of building a sea wall and grading for second-track between Everett, Wash., and Ballard was continued during the year, 15,333 lin. ft. of sea wall having been completed between Everett and Mosher. Second main track was laid between the company's ocean docks and the north portal of the tunnel under the city of Seattle, 1.78 miles, and between Hillyard and Spokane, 3.52 miles. Revision work on the present main line and construction of new second main track is in progress from the summit of the Rocky mountains to Java, Mont., 14.38 miles. It is expected that this work will be finished during 1910. The curvature on the present line will be materially reduced, and the construction of the second-track will avoid delays and congestion in handling traffic over the mountains, the grade on the east side of the mountains being 1 per cent. against westbound traffic, compared with a grade of 1.8 per cent. on the west side of the mountains against eastbound traffic. (See report of this company elsewhere in these columns.)

HUDSON BAY RAILWAY.—J. L. Armstrong, chief engineer in charge of surveys, is quoted as saying that the survey for the first 200 miles from The Pass, Keewatin, towards Hudson Bay, has been finished, and construction work will be started on this section next year. It has not yet been decided where the northern terminus will be located, as the reports of surveys made this year at the harbors at Fort Churchill and Port Nelson on Hudson Bay are not yet completed. (September 16, p. 520.)

HUDSON & MANHATTAN.—An officer writes that this company has extended the subway system from the Pennsylvania station, Jersey City, N. J., to Grove street, 0.83 mile, and in the borough of Manhattan, New York City, from Twenty-third street and Sixth avenue to Thirty-third street and Broadway, 0.45 mile. Work is under way from Grove street, Jersey City, to Summit avenue, 1.30 miles.

KENTUCKY MIDLAND.—Surveys are now being made for an extension from Earls, Ky., west to Madisonville, 14 miles.

LAKE SHORE ELECTRIC.—This company has projected an extension from Huron, Ohio, west for three miles. The company has finished a one-mile spur, connecting with the stone quarry near Castalia.

LEXINGTON & EASTERN.—See Louisville & Nashville.

LOUISVILLE & NASHVILLE.—This company has recently secured control of the Lexington & Eastern, which is building an extension from Jackson, Ky., up the north fork of the Kentucky river to a point near the headwaters of Boones Fork, about 96 miles. (See Lexington & Eastern, October 21, p. 760.)

MANITOULIN & NORTH SHORE.—Work is now under way by O'Boyle Brothers Construction Co., Ltd., Sault Ste. Marie, Ont., on an extension from Little Current to Whitefish, 18 miles. A further extension is projected from Whitefish to Crean Hill, 38 miles.

MEXICO TRAMWAY COMPANY.—The Mexican Congress has authorized this company to build two electric lines; one line is to run from Mexico City, Mex., southeast to Puebla, 125 miles, and the other from Mexico City, southwest to Toluca, 45 miles. The new company is a subsidiary of the Mexican Light & Power Company. Preliminary surveys have been made and work is to be started soon.

MEXICAN ROADS.—The Mexican Petroleum Limited, Ebano, Mex., will build a railway, it is said, along the Tuxpam river, 70 miles long.

MISSOURI, KANSAS & TEXAS.—The double-tracking work from Durant, Okla., north to Atoka, has been finished, it is said, and this section has been opened for service.

MUSCATINE NORTH & SOUTH.—This company will open for business on December 15, an extension from Oakville, Iowa, to Kensington, nine miles. The General Construction Company are the contractors. Surveys are being made for an extension from Kingston to Burlington.

NEVADA ROADS.—G. T. Wiswell and associates, of New York, will build 36 miles of railway, it is said, near Goldfield, Nev., to connect the Tonopah & Tidewater with the Las Vegas & Tonopah.

OCEAN SHORE.—This company has some grading work finished on an extension from Tunitas Glen, Cal., east to Scott creek, 26 miles.

SALISAW, MCALESTER & SOUTHERN.—Grading work is now under way from McAlester, Okla., to Savanna, 14 miles. J. C. Wilkinson is the contractor, McAlester.

SPOKANE & BRITISH COLUMBIA.—An officer writes that surveys are being made for an extension from Republic, Wash., southeast to Spokane, 140 miles. (April 15, p. 1017.)

ST. LOUIS SOUTHWESTERN.—An officer writes that work is under way on about 45 miles of the line between England, Ark., and Stuttgart and Hazen, also on another section of 69 miles between Gatesville, Tex., and Comanche. Thompson & Scott, St. Louis, Mo., has the contract for the work.

STOCKTON TERMINAL & EASTERN.—This company has work under way on an extension from Linden, Cal., to Bellota, four miles.

TREMONT & GULF.—Surveys have been made for an extension from Rochelle, La., to Natchez, Miss., 65 miles.

TUSCALCOSA MINERAL.—An officer writes that surveys have been finished from Tuscaloosa, Ala., east to Brookwood, 20 miles. Woolsey Finnell, Tuscaloosa, may be addressed.

UINTAH RAILWAY.—An officer writes that surveys are being made for an extension from Dragon, Utah, to Turtle, 12 miles.

WARREN, JOHNSVILLE & SALINE RIVER.—Surveys are being made for an extension from Goepel, Ark., to Johnsville, five miles. The company now operates a 16-mile line for freight traffic only, from Warren to Hermitage.

Railway Financial News.

BOSTON RAILROAD HOLDING COMPANY.—The Massachusetts Railroad Commission has authorized the Boston Railroad Holding Company to issue $20,012,000 4 per cent. cumulative preferred stock, to retire by exchange at par the outstanding $20,012,000 4 per cent. debenutre bonds of the Holding company. A special message from the governor of Massachusetts was sent to the last legislature recommending that Railroad Holding Company bonds be made legal investments for savings banks, but through the opposition of the banks the plan was abandoned. It was also found to be impossible to pass a valid law making the bonds tax exempt. The preferred stock of the Railroad Holding Company, it is understood, will be tax exempt in Massachusetts.

CHICAGO, ROCK ISLAND & PACIFIC.—A. J. Miller, James Douglas, James McLean and Arthur C. James were elected directors of the Rock Island Company, succeeding E. G. Boissevain, F. S. Pearson, Percival Farquar and E. D. Kenna. Mr. McLean was elected also a member of the finance committee, and Mr. James was elected also a director and a member of the executive committee of the Chicago, Rock Island & Pacific Railroad, succeeding Mr. Kenna. Mr. Miller succeeds Mr. Boissevain as a representative of the Dutch stockholders and the other three new directors represent Phelps, Dodge & Co., succeeding representatives of the Pearson-Farquar syndicate.

CHICAGO SOUTHERN.—See Chicago, Terre Haute & Southeastern.

CHICAGO, TERRE HAUTE & SOUTHEASTERN.—This company has been incorporated in Illinois and in Indiana as a successor to the Southern Indiana and the Chicago Southern.

DETROIT, TOLEDO & IRONTON.—The collateral deposited under the defaulted $5,500,000 5 per cent. notes of 1905 were sold at public auction on November 25 to Joseph A. Ramsey, Jr., the only bidder. Attorneys representing F. J. Lisman & Co., and the King committee filed a formal protest. The $5,000,000 consolidated mortgage 4½ per cent. bonds of the Detroit, Toledo & Ironton were sold for $500,000, and the $3,001,000 Ann Arbor common stock and the $2,190,000 Ann Arbor preferred stock were together sold for $2,000,000. This stock carries with it control of the Ann Arbor.

LEXINGTON & EASTERN.—See Louisville & Nashville.

LOUISVILLE & NASHVILLE.—This company has bought all of the $500,000 stock of the Lexington & Eastern, and nearly all of the $1,500,000 general mortgage bonds and $330,000 deferred debentures, "thereby assuming an issue of first mortgage bonds ($800,000) which mature during the year 1911, so that it is expected that within a reasonably short time the property will be entirely clear of all mortgage obligations." The Lexington & Eastern runs from Lexington, Ky., to Jackson, 93 miles.

MOUNT AIRY & EASTERN.—This road has been sold under receiver's sale for $20,000, to John Hare, of Washington, D. C. The road, which is narrow gage, runs from Mount Airy, N. C., to Keblers Mills, Va.—12 miles.

NEW YORK CENTRAL LINES.—J. P. Morgan & Co. have bought an additional $7,500,000—4½ per cent. New York Central Lines equipment trust certificates. This is the remainder of the $30,000,000 authorized issue of equipment trust certificates, and the block of bonds now sold mature $500,000 annually from 1911 to 1925. The *Wall Street Journal* says that the bonds were placed on terms which represent a cost to the company of 4.65 per cent. for the money.

SOUTHERN INDIANA.—See Chicago, Terre Haute & Southeastern.

WABASH-PITTSBURGH TERMINAL.—Bankers interested in the reorganization plans of this company and of the Wheeling & Lake Erie are quoted as saying that the Wallace Protective committee within the past ten days adopted a plan for the reorganization of both of these companies. When circulated unofficially it met with so much opposition that it was decided to withdraw the plan and attempt to draw up one more satisfactory to the bondholders and especially to the interests represented by the Chaplin committee.

Supply Trade Section.

The Union Switch & Signal Company announces that on and after November 28, 1910, the western district office will be located in Room 1041, Peoples Gas building, Chicago.

Bids are asked for 12 third-class passenger cars for the Imperial Chinese Tientsin-Pukow Railway. Specifications may be obtained from the railway purchasing agent, Taotai Y. C. Tong, Imperial Chinese Telegraphs, the Bund, Shanghai, China.

Bids were asked for supplying 19 locomotives for the Imperial Chinese Tientsin-Pukow Railway, northern district. Specifications and drawings may be obtained at the office of Deutsch-Chinesische Eisenban Gesellschaft mit Beschrankter Haftung, Berlin, Germany.

The Falls Hollow Staybolt Company, Cuyahoga Falls, Ohio, has appointed Thos. F. Meek as its representative for southern Michigan, with offices at 415 Moffat building, Detroit, Mich. Mr. Meek was secretary and manager of sales for the Detroit Steel Casting Company for 20 years.

C. H. Duell, of the law firm of Duell, Warfield & Duell, New York City, has been elected a director of the Safety Car Heating & Lighting Company, 2 Rector street, New York City. Mr. Duell was at one time Commissioner of Patents, and later a Judge of the Court of Appeals of the District of Columbia.

Otto Best, for eighteen years air-brake inspector of the Nashville, Chattanooga & St. Louis, has resigned, to accept the position of assistant to the president of the Nathan Manufacturing Company, 149 Broadway, New York. Mr. Best will be in charge of the works of this company and will perform such other duties as may be assigned him by the president.

Otto Best

He started in railway work as a machinist's apprentice for the Vandalia Railroad at Terre Haute, Ind., and after serving his term accepted a position with the Southern Pacific at Los Angeles, Cal. He served in various departments of that road for some time and was put in charge of the tool department, and later took up air brakes. After being with the Southern Pacific for seven years he accepted the position of air-brake inspector of the Nashville, Chattanooga & St. Louis in March, 1892, which position he has held ever since. In 1907 he was placed in charge of the Atlanta yards of the Western & Atlantic, a subsidiary line of the Nashville, Chattanooga & St. Louis, and remained there for two and a half years, returning to Nashville to look into the question of loss and damage to freight, to which question the road was giving considerable attention.

He was at one time president of the Air Brake Association and at present is treasurer of that association.

The St. Louis & San Francisco turned out of its Springfield, Mo., shops on November 19, an Atlantic type locomotive, No. 1007, with the drivers and trailing wheels fully equipped with Smith locomotive adjustable hub plates. The engine will be placed in service on a fast mail run between Monett and Newburg, Mo., and the device will be given a thorough test. It is made by the Smith Locomotive Adjustable Hub Plate Company, Pittsburg, Kan.

The Grip Nut Company, Chicago, announces the appointment of Thomas P. Swan as northwestern representative of that company, with headquarters at 315 Minnesota street, St. Paul, Minn. Mr. Swan was at one time connected with the mechanical department of the Great Northern, and has a wide acquaintance among railway and supply men in the vicinity of the "Twin Cities."

John I. Rogers has opened a New York office in the City Investment building at 165 Broadway and will use it as his main office. He is making a specialty of forging by the steam hammer, the drop hammer and the hydraulic press; of special rolling, such as railway tires and rolled wheels; of the use and manufacture of alloy steels; of machine shops and power plants and of general iron and steel works engineering. Mr. Rogers resigned from the Midvale Steel Company of Philadelphia about one year ago to take up professional practice and since that time has been engaged in consultation work and design along the above lines.

"The Institute of Industrial Research" has been established at Washington, with the object of undertaking the investigation of industrial problems in all lines, particularly problems in metallurgy, agricultural chemistry, hydraulic cement, paint technology and all chemical industries. The director is A. S. Cushman, heretofore engaged in this kind of work for the government. His office is at 804 Hibbs building, and he is to build laboratories in the southwestern part of the city, near the Washington monument. Among Mr. Cushman's associates will be Henry A. Gardner and Dr. N. M. Hopkins.

TRADE PUBLICATIONS.

Manual of the American Articulated Compound Locomotive.—The American Locomotive Company has issued Bulletin No. 1006, relating to the articulated locomotive in the form of a manual of instruction to engineers, firemen and shop repairmen; the purpose being to make such employees more familiar with the construction and operation of this type of locomotive. The first part relates to a general description of the articulated compound locomotive. Then follows plain illustrations of the different details of the intercepting valve and a very complete description of its operation. This portion is illustrated by specially prepared cuts in transparent perspective, which will be found very useful in obtaining a thorough understanding of the operation of the intercepting valve as applied to the Mallet compound engines. The pamphlet also contains good drawings of the power reversing gear, by-pass valves and vacuum relief valve. There are also illustrations of flexible joints in the large steam and exhaust pipes, with directions especially prepared for instruction in the maintenance of the packing. The articulated locomotives built by the American Locomotive Company are provided with "trim" bolts, which are intended for the adjustment of the alinement on the front engine frames. These are also illustrated, and a clear explanation is given of their use and operation. The pamphlet closes with a summary of rules for operating the American articulated locomotives, especially with respect to starting, drifting, care of special parts, repairs to flexible joints, and lubrication. This manual should be in the hands of all those connected with the operation and repair of this type of engine, and doubtless will assist materially in a better understanding and better maintenance of the parts peculiar to it.

RAILWAY STRUCTURES.

HOMESTEAD, PA.—Surveys have just been finished by the Pittsburgh Railway Company for a subway at Fourth avenue and West street, Homestead, under the tracks of the Pittsburgh & Lake Erie and the Pennsylvania railways. This improvement will abolish the dangerous grade crossing at Amity street.

MISSOULA, MONT.—See an item regarding the new passenger station for the Chicago, Milwaukee & Puget Sound in General News.

STEVEN'S POINT, WIS.—The Minneapolis, St. Paul & Sault Ste. Marie has started work, it is said, on a new roundhouse at Steven's Point.

Late News.

The items in this column were received after the classified departments were closed.

Gerrit Fort, passenger traffic manager of the Union Pacific at Omaha, Neb., has been appointed also passenger traffic manager of the Oregon Short Line, with office at Omaha.

H. J. Horn, assistant general manager of the Chicago, Burlington & Quincy lines west of the Missouri river, at Omaha, Neb., has been appointed assistant to the president of the New York, New Haven & Hartford, with office at New Haven, Conn.

At a special meeting at Salt Lake Wednesday, Oregon Short Line stockholders authorized a $150,000,000 mortgage on the property, including all branches built under the Harriman management. This is part of the plan for new financing of the Union Pacific affiliated lines. None of the new bonds will be issued for some time.

L. J. Ferritor, division superintendent of the Wabash Railroad at Decatur, Ill., has been appointed superintendent of the Northern and Southern divisions of the Chicago & Alton, with office at Bloomington, Ill., succeeding P. G. Walton, formerly superintendent Northern division, resigned, and C. F. Smith, superintendent Southern division, assigned to other duties.

A Chicago despatch says that the Harriman lines are making inquiries for 196 locomotives of all types, evenly distributed, and contemplate buying between 100,000 and 115,000 tons of rail, compared with 275,000 tons last year. Decision regarding rail and equipment needs, outside of locomotives, is not definite, but rail orders will be based on ordinary renewals without regard to new construction, except what the old rails can accommodate.

At the rate hearing on Wednesday before the Interstate Commerce Commission several witnesses were called from the railway supply industry, all of whom testified to the fact that while their commodities have not increased in cost to the railroads, unit for unit, they are now turning out a more finished and efficient product which will do a great deal more work. L. D. Brandeis put on witnesses representing several branches of various industries, all of whom protested against the increase in rates because it would limit their selling territory.

E. M. Rine, superintendent of the Delaware, Lackawanna & Western, at Hoboken, N. J., has been appointed assistant general superintendent, with office at Scranton, Pa. S. S. Stone, assistant superintendent at Hoboken, has been appointed acting superintendent of the Morris & Essex division, succeeding Mr. Rine, and H. H. Shepard, superintendent of the Scranton division, at Scranton, has been granted an extended leave of absence and his duties will be performed by the assistant general superintendent. F. M. Benning, passenger trainmaster, at Hoboken, has been appointed assistant superintendent of the Morris & Essex division, with office at Hoboken, and J. W. Pierce succeeds Mr. Benning.

Judge Gary, chairman of the board of the United States Steel Corporation, on Wednesday afternoon gave out the following statement:

"Representatives of about 95 per cent. of the manufacturers of steel in America met at luncheon [in New York] today, and the two hours following were occupied in ascertaining the condition of business in this particular line and in the expression of opinions concerning current prices. It was stated that on the average of all branches the bookings are about 50 per cent. of capacity and the shipments somewhat in excess. There has been a slight though marked increase of daily bookings month by month since the first of August to the present time. Prices as a rule are well maintained, though in some lines as usual there is some cutting on the part of small producers who were not represented. Without exception the views expressed by those present regarding the future were favorable. Also each one voiced the opinion that present prices are fair and reasonable and should not be changed. For some time past purchasing by railway companies has been very much below normal; but it is the consensus of opinion that there will be an increase in the near future. The amount of daily bookings at the present time is about equal to the capacity of the mills ten years ago. "The disposition of the manufacturers of steel to coöperate so far as it is proper, remains unchanged."

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Winston-Dear Company, of Minneapolis, Minn., has ordered 2 six-wheel switching locomotives from the American Locomotive Company. They will have 18 in. by 24 in. cylinders, 50 in. driving wheels, and will weigh 112,000 lbs. in working order.

The Grand Trunk has ordered 12 compound consolidation locomotives from the American Locomotive Company. They will have 22½ in. and 35 in. by 32 in. cylinders, 63 in. driving wheels and will have a total weight in working order of 205,000 lbs.

The Delaware & Hudson has ordered 11 locomotives from the American Locomotive Company. The order includes 5 ten-wheel passenger locomotives with 21 in. by 28 in. cylinders, 63 in. driving wheels and having a total weight in working order of 186,000 lbs.; one ten-wheel superheater passenger locomotive with 23 in. by 26 in. cylinders, 63 in. drivers and having a total weight of 190,000 lbs.; one consolidation superheater locomotive with 24 in. by 30 in. cylinders, 57 in. drivers and a total weight of 202,000 lbs.; and 4 Mallet articulated compound locomotives with superheaters and having 26 in. and 41 in. by 28 in. cylinders, 51 in. drivers and a total weight of 450,000 lbs.

The New York Central Lines have ordered 275 locomotives from the American Locomotive Company, as shown on the accompanying table. These orders have been placed from time to time recently, but this is the first announcement that has been made concerning them. They are all for 1911 delivery:

Number.	Type.	Cylinders.	Driving Wheels.	Total Weight.
10	4-6-2	26 x 26 in.	69 in.	266,000 lbs.
50	4-6-2	24 x 26 "	69 "	262,000 "
10	4-6-2	22 x 26 "	75 "	234,000 "
10	4-6-2	22 x 26 "	75 "	247,000 "
30	4-6-2	23 x 26 "	79 "	266,000 "
25	2-8-0	23 x 32 "	63 "	236,000 "
55	2-8-0	23 x 32 "	63 "	239,000 "
15	2-8-0	23 x 30 "	57 "	241,000 "
20	0-6-0	21 x 28 "	57 "	165,000 "
25	0-6-0	20 x 26 "	51 "	153,000 "
25	2-6-6-2	21½ and 34 x 32 in.	57 "	354,000 "

CAR BUILDING.

The Chicago Railway Company is in the market for 215 pay-as-you-enter cars.

The Illinois Central is building 22 cabooses, and will build 30 more at its Burnside, Ill., shops.

The Spokane, Portland & Seattle has ordered a number of tank cars from the Pressed Steel Car Company.

The Great Northern is in the market for 400 50-ton hopper cars, 500 50-ton ore cars and 75 50-ton tank cars.

The Richmond, Fredericksburg & Potomac, it is said, will build 25 box cars in company shops. This item is unconfirmed.

The Baltimore & Ohio has ordered 50 all-steel passenger coaches, of which 30 will be built by the American Car & Foundry Company and 20 by the Pullman Company.

IRON AND STEEL.

The Pennsylvania Railroad has ordered 150,000 tons of rails for 1911 delivery from the United States Steel Corporation, the Lackawanna Steel Company, the Pennsylvania Steel Company, the Cambria Steel Company, and the Bethlehem Steel Company.

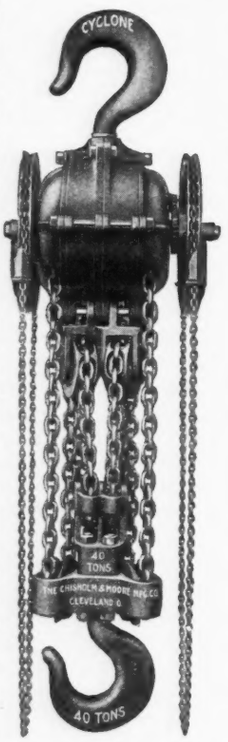
SIGNALING.

The Chicago Signal Club held its second November meeting on Monday night, November 28, at 303 Dearborn street. The meeting took up a study of the methods of switch protection in automatic territory. The various methods in common use, the simple shunt, the series shunt and the line control were considered and the advantages of each noted. The various combinations possible with these forms were described and discussed by their advocates. The club then took up means of remedying foreign current trouble and a number of useful suggestions were brought out from the experience of the members. The next meeting will be held at the same place.

Shop Equipment.

Cyclone Chain Hoist.

The Chisholm & Moore Mfg. Co., Chicago, have added a 40-ton size to their line of Cyclone hoists. The construction permits making the parts of such a size as to give great strength and wearing capacity. The head of the hoist is divided into three sections by two partitions, the two outer sections each containing a load chain wheel, and the central section a pinion and three spur gears. This pinion is mounted on the hand-wheel shaft. The two load chain wheels are each mounted on a hollow steel shaft; the hand-wheel shaft passes through these hollow shafts, carrying a pinion in the central division, which drives three spur wheels. These spur wheels are mounted on shafts 1¾ in. in diameter, turned down to eccentric ends of 1¼ in. diameter. These three eccentrics carry in each of the outer divisions spur wheels having 48 teeth, which mesh into internal gears on the load chain wheels, having 50 teeth, so that each revolution of the eccentric gives a gyratory movement to the spur wheel, moving the lead chain forward two teeth.



40-Ton Cyclone Hoist.

The hand-wheel shaft turns in graphite bronze bushings, the eccentrics in hardened steel roller bushings; the eccentric shafts are hardened, and hardened and ground steel bushings are pressed into the malleable iron frame; the steel rollers are contained in cages. The hoist has a multiple disk brake, which effectually locks the load, and at the same time permits free lowering by a reverse movement of the hand wheel.

It also has two independent load chains moving together; the idler sheaves are so placed as to permit the doubling up of the chain, so that the load is carried on eight strands of ¾ in. chain. The idler sheaves are all bushed with graphite bronze self-lubricating bushings. None of the bearings require oiling. The hoist is compact in form; the minimum distance between the upper and lower hooks is 82 in. and the weight is 2030 lbs., the forged hooks alone weighing about 140 lbs. each. The hoist has a high efficiency, a pull of 80 lb. on each of the two hand-chain wheels raising 40 tons.

The 16, 20 and 30-ton sizes are similar in construction, except that the 16-ton size handles its load on four strands of ⅝ in. chain, the 20-ton size on four strands of ¾ in. chain and the 30-ton size on six strands of ¾ in. chain. The 16-ton size has one hand-chain wheel and the larger sizes two hand-chain wheels.

Machine Tool Exhibit at the Buenos Ayres Railway Exhibition.

The Niles-Bement-Pond Company, according to *The Railway Gazette* of London, has an extensive exhibit of machine tools at the Buenos Ayres Railway exhibition. It is specially noteworthy for the striking manner in which it has been arranged, the machines being staged in line on one side of a broad aisle, with a considerable free space between each machine, so that every facility is afforded for inspection of the various tools without any overcrowding. Framed photographs, giving different views of the machines, are shown to advantage in the intervening spaces.

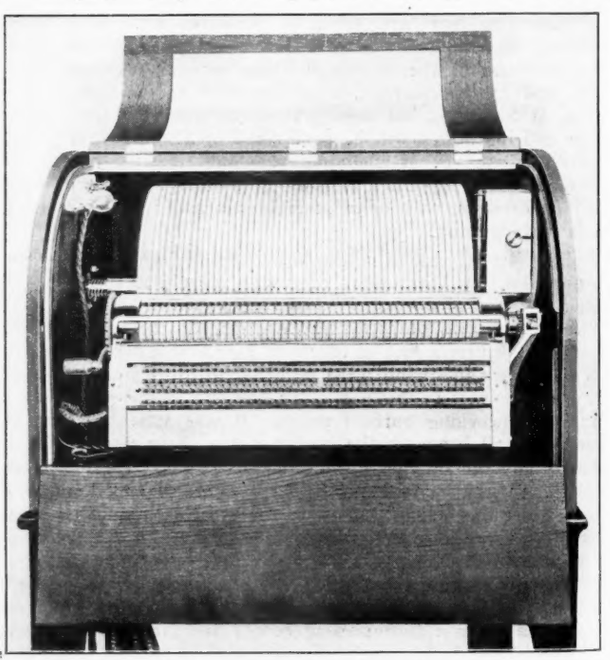
The heavy driving wheel and car wheel lathes are exhibited with work in place, the latter machine being shown in actual operation. It is designed for turning at the same time two 42-in. or smaller, car wheels on their axles, and while being turned each wheel is firmly supported on both sides so that there is no chance of spring or chatter, thus insuring maximum output. Driving plates located between the wheels equalize the pressure on the tools. The axle journals are grasped by self-centering bushings which insures the tires being concentric with the journals. Excellent results have been obtained with this lathe by inexperienced Argentine operators, the average time required for turning a pair of car-wheels being less than 35 minutes. The best record for turning a pair of wheels was 30 minutes, 17 seconds, which includes the time occupied in placing the wheels in position on the machine and returning them to the floor.

The new model Niles locomotive driving wheel chucking lathe, a heavy motor-driven tool, has a capacity of 10 pairs of locomotive driving wheels per day of 10 hours. A novel feature is the method of driving the face-plate, which is effected by means of internal instead of external gears, leaving the outer rim of the face-plate and gear perfectly smooth. The tool rests are of massive construction and are arranged to swivel. The machine is made in two sizes, of which the smaller will take wheels of from 42 in. to 76 in. and the large from 42 in. to 86 in. In each case a 50-h.p. motor is employed for the main drive.

In addition to these two machines a universal radial drill, a 300-ton hydraulic wheel press, a heavy double axle lathe and several other tools made by the Niles-Berment-Pond Company are on exhibition.

National Machine Recorder.

The National machine recorder, which was described in the *Railway Age Gazette* of October 2, 1908, has been perfected since that time by the addition of a number of important devices. The new features include an adding attachment, a time setting device and a set of production counters. The adding attachment shows in large figures the net amount of time that each producing unit in the shop has been working, or, if desired, the amount of idle time that has occurred at any time during the day and the total at the end of the day. The time setting device is particularly valuable, as it schedules every part that goes through the shop and allows the management to see instantly whether an operator has consumed any fraction of time in performing his operation above that which has been allowed. The production counters are placed directly above the time adding attachment and record each piece produced by either machine, as it is finished, and show at a glance the exact output, the time consumed and the time wasted in producing this output for any given time. This machine is now in operation and is greatly assisting in accurate supervision of producing plants, and has proved highly valuable in permanently increasing plant efficiency, as it furnishes


National Machine Recorder.

data as to the three essentials to increased efficiency, namely, ouput, producing time, wasted time and cause. The National Machine Recorder Company, Chicago, is the manufacturer of the device above described.